AMERICAN MACHINIST

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Water-Works at Auburn, N. Y.

We give an illustration of a recent example of American water-works engineering, which we think will be of interest to our readers on account of some novel features embodied in the plan. The works referred to are at Auburn, N. Y., and are owned by a water company.

The works were constructed on the Holly system in 1865, with eight miles of pipe, and at the time of making these improvements had thirty miles of distributing mains and 300 fire hydrants. In the spring of 1883 it was found desirable to obtain water from Owasco Lake, taking it at a suitable distance from the shore, as water of a purer quality could be obtained than was furnished by Owasco River, that brought water by the city pumping station for a distance of about two miles, and from which the supply had previously been obtained. The Board of Directors of the water company, in consultation with the Holly Manufacturing Company, of Lockport, N. Y. determined to lay a pipe from the lake to the city pumping station; contain the seven and one-half million gallon Gaskill compound pumping engine at the lower station, and the laying of a 30-inch wrought-iron influent pipe from a crib 600 feet from the pump-house in the lake, the end of the pipe being 1,400 feet from the shore line.

The Owasco River, above referred to as being originally used to bring water to the city pumping station, also furnished water to operate turbine water-wheels for the driving of suitable pumps supplying the distribution to the city. In the design of the Gaskill engine, provision was made so that the steam cylinders could be disconnected from the pumps, and the pumps operated by the water-power furnished by three turbine water-wheels. This arrangement is shown in Fig. 3, page 2. The 24-inch suction pipe is shown entering the building at *I*, with a large wrought-iron air chamber *H*. This pipe is connected directly to the pumps. In case it is desired to operate the pumps by water-power, the pinion *F* can be slipped so as to engage with the gear *E*. The gear *E* operates as a fly-wheel to the engine when the machine is disconnected from the water-wheels, *A*, *B* and *C*. When the pumps are being operated by water-power, the piston-rods of the steam cylinders are disconnected, and, when the engine operates by steam alone, the pinion *F* is disconnected from the gear *E*.

It was found after starting that the pump at the city station could not draw the water from the lake direct for but a few hours at a time without air accumulating in the highest points of the suction pipe at *A*, *B* and *C*, Fig. 2. In order to remedy this, Mr. Eldred, the superintendent, had a small gas-pipe laid connecting these high points with a small air pump, which was driven by the water-wheels. By keeping this air pump in motion a sufficiently perfect vacuum could be maintained in the suction pipe, so that the large pumps would draw water directly from the lake without the necessity of operating the lake station. This pipe, 24 inches in diameter and 9,830 feet long, is believed to be the longest pipe used in this way in the world.

The Gaskill engine at the lower station is represented in perspective in Fig. 1, which figure shows the arrangement of the gearing that permits the pumps to be driven either by steam or water-power, or steam and water-power combined. This engine differs only from those built for being operated by steam alone in the addition of the gearing above referred to. In Figs. 4 and 5 the mechanism for operating the double-beat admission valves to the high-pressure cylinder, also the

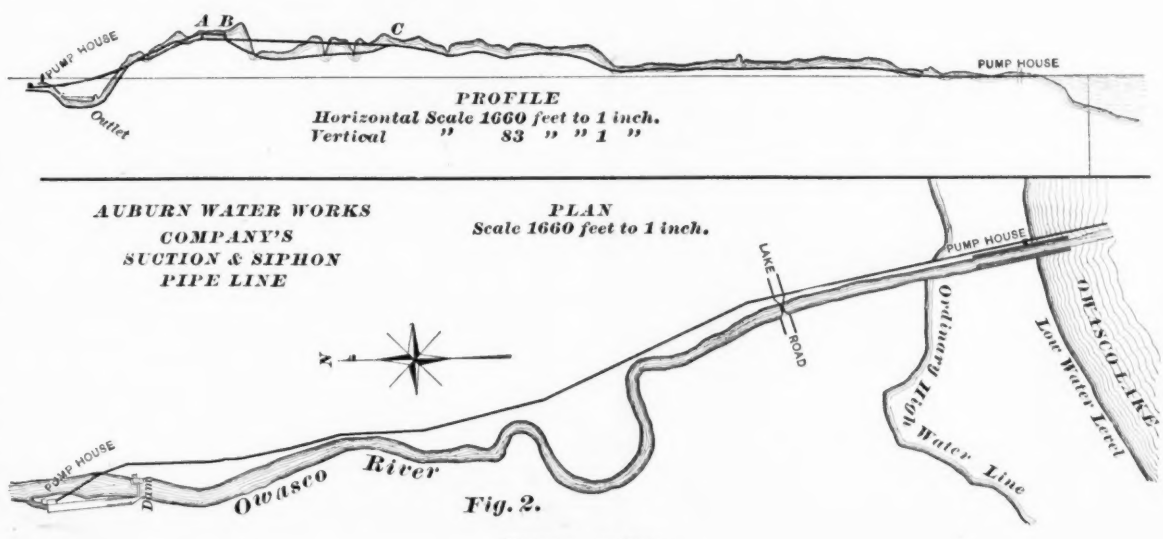


Fig. 2.

PROFILE OF PIPE.

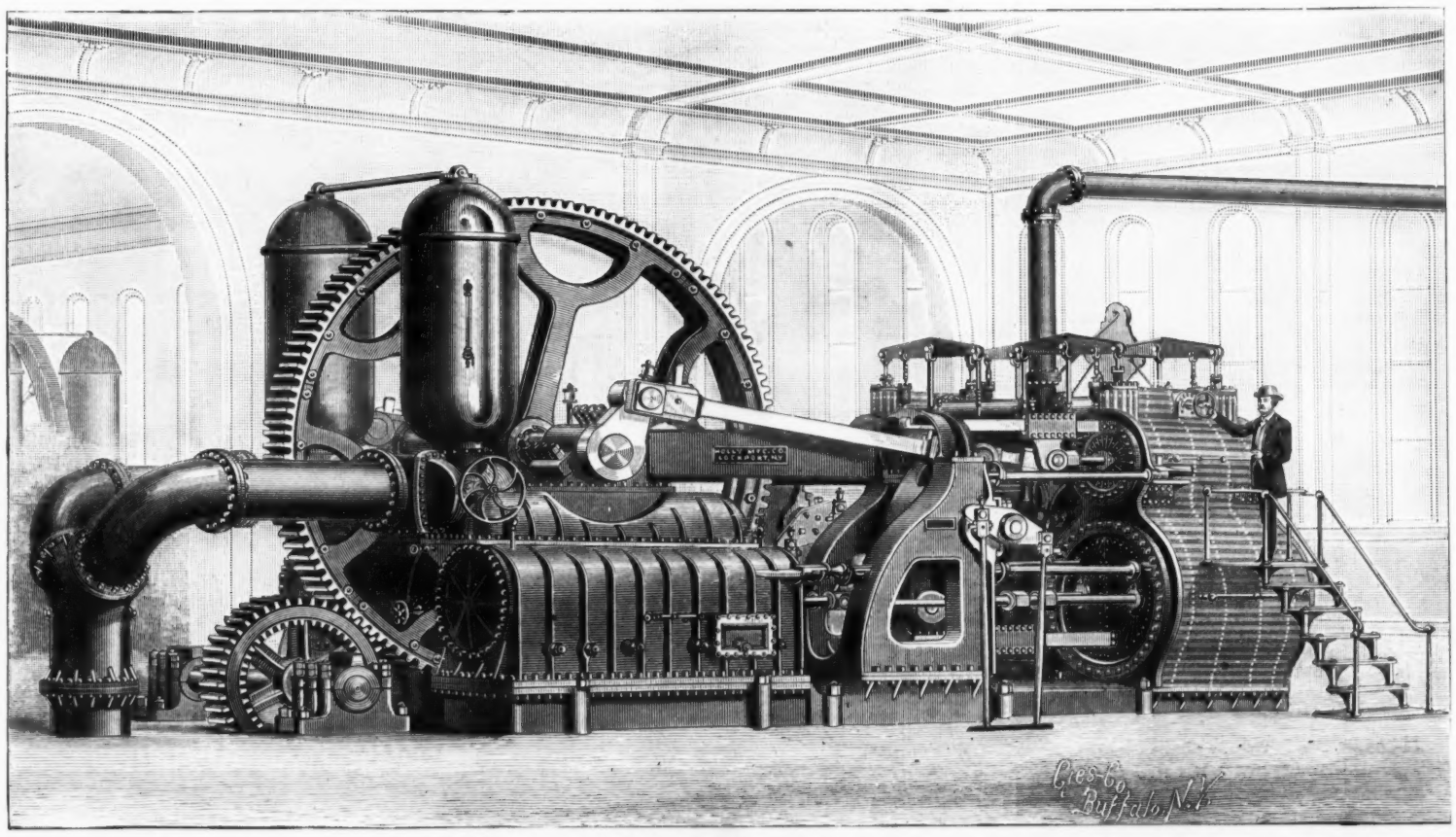
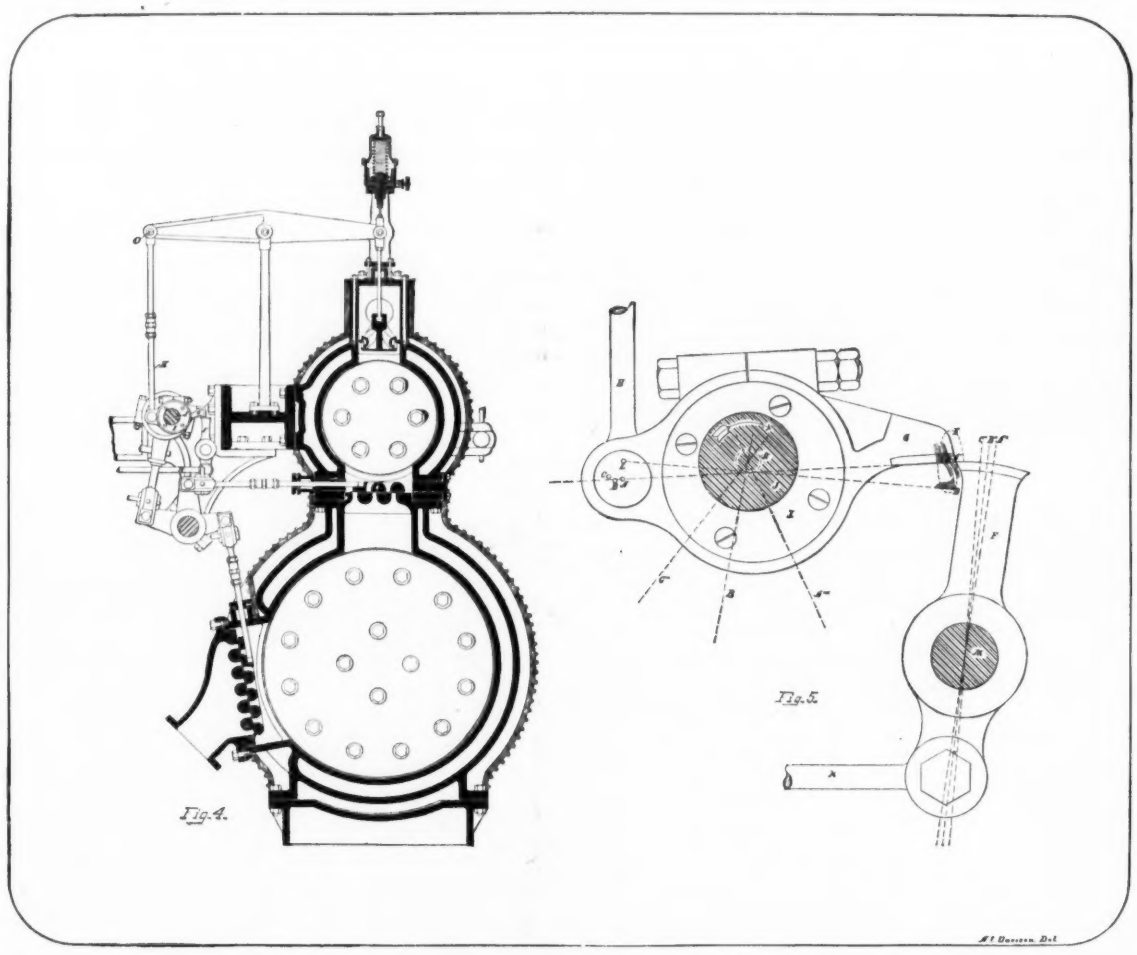


FIG. 1—GASKILL PUMPING ENGINES.

grid-iron slides that form the admission and exhaust valves to the low-pressure cylinder, are shown. Fig. 4 is a section taken through a high and low-pressure steam cylinder of the engine, and shows the arrangement of the valve gear. Fig. 5 shows the eccentric cam which operates the admission valves to the high-pressure cylinder, and also shows the different positions of the arm *F* when cutting off at one fourth, one-half and three-fourths of the stroke. It will be seen from an inspection of Fig. 5 that the cam or abutment *F* can be set so that the admission valve will cut off at any point during the stroke. The rods *K* of each of these abutment pieces *F* are so connected together that the four abutment pieces move simultaneously, one for either end of each cylinder.



There has not been an official test made of this pumping engine for the purpose of ascertaining its economy, but tests made by the superintendent are said to have demonstrated its ability to perform a duty in excess of 100,000,000 while pumping direct on the Holly system. The pumps have been operated to a capacity of 7,500,000 gallons in twenty-four hours against fifty pounds water pressure, the steam being supplied by one boiler five feet in diameter and fifteen feet long.

A manufacturer of Breslau is stated to have built a chimney over 50 feet in height entirely of paper. The blocks used in its construction were made of compressed paper, jointed with silicious cement. The chimney is said to be very elastic, and also fireproof.

We may add that picture frames are now made of paper on the Continent. Paper pulp, glue, linseed oil and carbonate of lime or whiting are mixed together and heated into a thick cream, which, on being allowed to cool, is run into moulds and hardened. The frames are then gilded or bronzed in the usual way.—*Engineering.*

A building for a library, together with $1,000 in cash, has been presented to the workmen of the Keystone Bridge Works, at Pittsburgh, by Andrew Carnegie.

Jay Gould is reported as saying that he would like to see the employes of the Missouri system of railroads own houses along the line of the road. There are a good many others who would like to see this, and who are disposed to ask what Gould has ever done to enable his employes to own houses. Other railroad corporations—notably the Baltimore and Ohio—have taken steps in this direction. What has Jay Gould ever done except to express the wish—and cut down pay?

Breaking of Cylinder Heads, and Poorly Fitted Main Rod Brasses.

BY J. D. CAMPBELL.

A recent issue of the AMERICAN MACHINIST contained an article on the bursting of locomotive cylinder heads, and attributed it to the presence of water in the cylinder. That is not the first time that this has been said to be the cause of that kind of an accident; it is the common reason given for it, and is a very convenient one for the mechanic or engineer to give, who may have been remotely or directly responsible for it, and who would have been held so had the cause been investigated.

The time at which a locomotive is most liable to have water in its cylinders is when it has been standing for some time, then as a rule it is due to steam that has leaked through the throttle valve, condensed in the pipes and steam chests, and settled back in the steam passages in the cylinders and saddle, and remained there until steam is admitted through them to move the locomotive. That portion of the steam that may have passed into the cylinder and condensed there, is drained by the cylinder cocks, if they are, as they should be, left open and placed on the bottom of the cylinder Another quantity of water is that due to the condensation of part of the steam admitted to the cylinders to move the locomotive, coming in contact with the walls of the

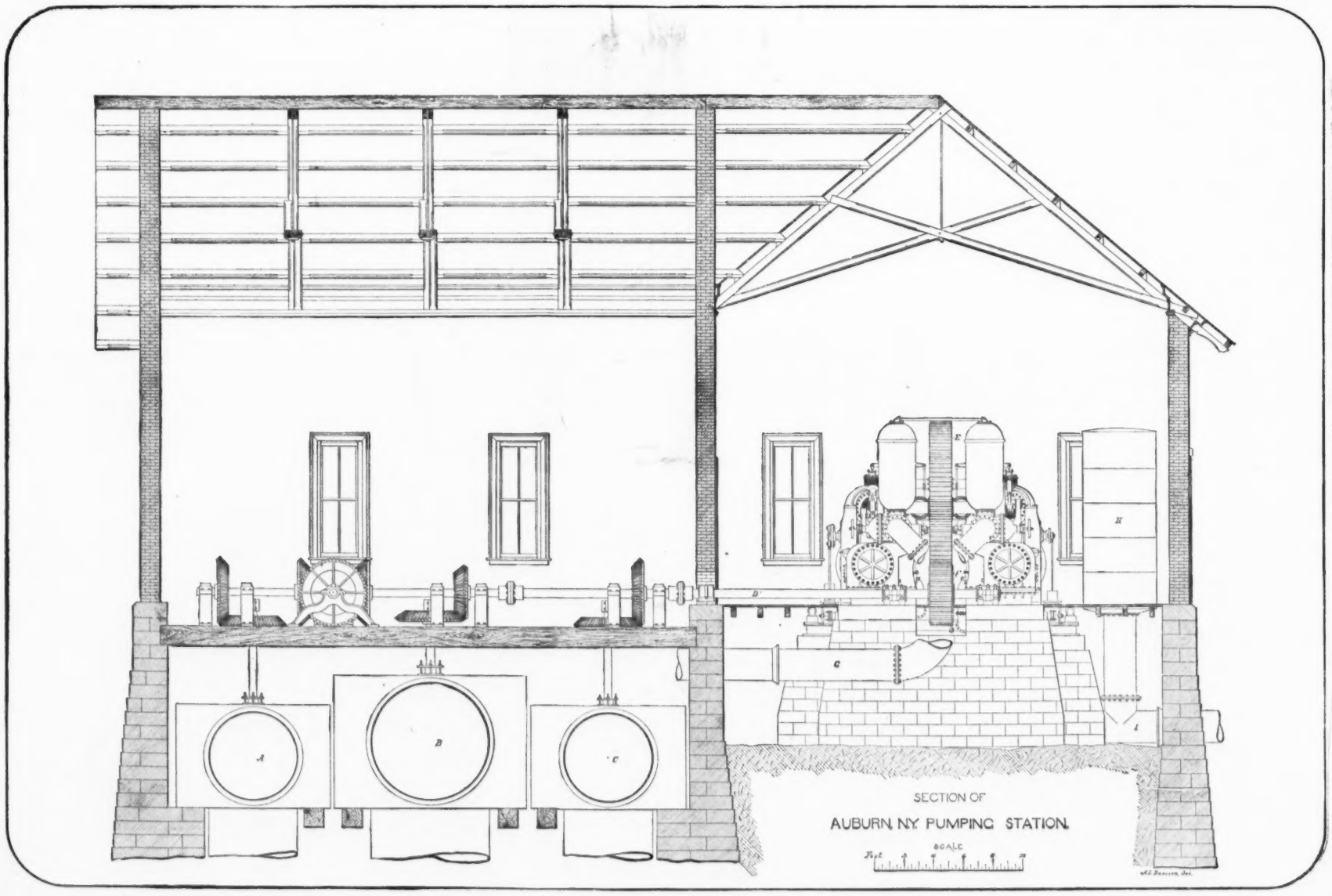


FIG 3—AUBURN PUMPING STATION.—See Page 1.

cylinders and steam chests. The conditions of an engine-house, or locality in which a locomotive stands, cause it, to prevent accident, if from nothing else, to be at first moved slowly, and the steam required to move it carries the water that may be in the steam passages into the cylinders, which, with that due to condensation in the steam chests and cylinders and in its escape in the exhaust passages and stack, makes a large exhibit when it leaves the stack and descends, and one that the fireman does not care to see, and tries to avoid. Yet, were the conditions such that an empty locomotive could be moved rapidly from a state of rest, the small pressure of steam required to do it would make that on the valve less than the resistance of the cylinder heads and allow it to lift and relieve the water in the cylinder should its cocks be closed, and to which can be often attributed the cause of valve yokes bending.

The condition under which water in the cylinders would burst the heads would be that of a locomotive with a train attached that required a high pressure of steam to move it, and made the pressure on the valve greater than the resistance of the head; then at high piston speeds the quick impact of water in the cylinder would knock out the head. But, then, as a competent person is in charge, who would consider it a disgrace to "flood" his engine, and who quickly recognizes the knock that a small quantity of water in the cylinder will give when asking to have the door of escape opened, and will quickly grant its request by opening the cylinder cocks for it, while it is not impossible, it is quite improbable, that many cylinder heads are knocked out by water in the cylinders. But that accidents of this kind do occur is a fact, and also that there is a cause for it, and one that, apart from loose or broken follower bolts, can be looked for in the main rod.

Probably no part of a locomotive is oftener repaired, and does harder work, than its main rods, and while the side rods receive all care and attention, but little is paid to the main rods except to keep them running, cool and free from pounding. An order to reduce locomotive main-rod brasses is filled, generally, by removing them from the strap, filing their faces, and by the face that may be found on them approximating the amount taken off each brass, and putting the same amount of liners behind it; or before removing the rod by marking the position of the crosshead upon the guides and retaining it when the rod is put up. That shop that compels the striking points to be taken each time the rod is taken down, to prove the clearance, and has the rod adjusted to make it equal at each end of the cylinder, is the exception rather than the rule, and would, on running repairs, be considered wasteful of time; it is considered that the usual amount of clearance does not justify such pains.

Were the amount of wear equal on each end of the rod, and the keys so placed that they would counteract the tendency of each other to lengthen or shorten the rod when driven, marking the position of the crosshead on the guide would keep the rods within a safe length, but as these conditions do not exist, doing so is but retaining defects that may have previously existed in the length of the rod. Or, were the amount of clearance constant at all times while a locomotive was in service, and the rod fitted up when in the shop without any except the key-liner, keeping the same amount of liner behind, each brass would retain its length. But the amount of liner that may have been put in when the rod was fitted up cannot be known to the many who may subsequently work upon it, and who may consider it as a part of the liners used in making up for the reductions of the brasses; this uncertainty should be considered when lining a rod.

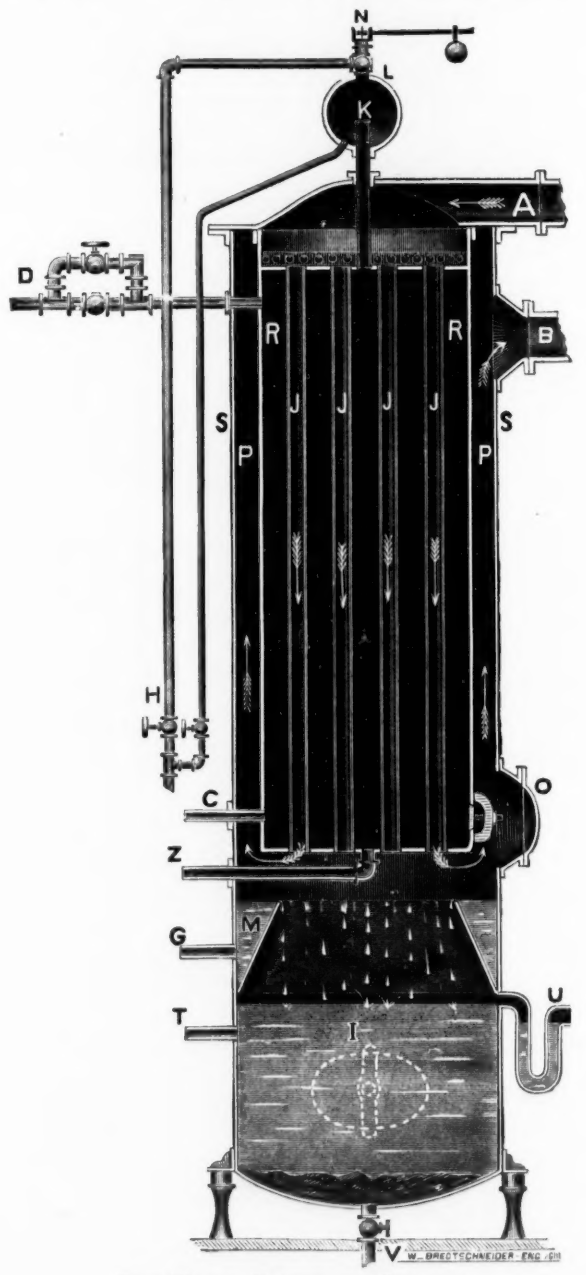
Were the amount of clearance in the cylinders constant and marked upon the guides, it would not be necessary to prove it; but the amount is not constant, and is due to the accumulation of tallow, etc., on the piston and cylinder heads, which in time becomes nearly as hard as the iron itself. Where spring cylinder-packing is used that requires frequent adjusting, this accumulation on the front cylinder-head, and follower is kept down; but with the use of plain rings or steam-packing that does not require so frequent attention, it may continue until it takes up the amount of the clearance, and yet not cause a knock on the cylinder until on some hard pull the crank pin springs ahead a trifle, the cylinder back, the locomotive slips for an instant, and the quick impact upon the head causes it to give way before the dirt upon it is knocked off, and what has been caused by imperfect lining of the rod and not trying the clearance is blamed to water in the cylinder. The tendency of the rod to lengthen by keying, and by lining behind the key to raise it, causes the accident as a rule to take place in the front end of the cylinder.

But neglect in the care of main-rods does not consist alone in not keeping them of a proper length, but, also, in the shape in which the brasses are sometimes filed when reducing them. When the locomotive is in the shop for repairs, and rods refitted with new brasses, care is taken that they shall fill the straps properly, and that the faces shall be at right angles to the sides, so that when they come together they will not spring the flanges. Care is also taken that the keys have a full bearing on their backs, or on the key liners, to prevent springing the strap, and that when bored to fit the pin that the boring is done at right angles to the line of the rod. After this has been done care should be taken when it becomes necessary to reduce the brasses, that the faces are kept at the proper angle to the sides and body. When this is not done, and the faces of the brass are brought together, the flanges must spring to allow them to do so. The bearing is thus thrown out of line with the pins, and the bearing on it reduced. The result of this is that the bearing is apt to run warm and wear rapidly until it comes to a full bearing, by which time the brasses must be again reduced. If not at the proper angle to the body, or parallel to the back, when the key is driven, it is rocked in the strap, springing that and injuring itself.

With a stiff main-rod, and where the crosshead is carried on four-bar guides, no other effect than the loosening of the brasses in the strap and their running warm, may be noticeable as the result of the brasses not having their faces kept parallel with the journal bearing. But the tendency will be for the rod, when the power is applied in a pushing direction, to assume a position at right angles to its bearing on the pins, which is resisted by the side bearing of the crosshead in the guide. With the over-hung crosshead its construction will allow the head to swing laterally to an amount that equals the amount of freedom it has on the guides, and will permit a bend to that amount at the point of connection between the head and the rod, and in the center line of the cylinder and pin, when power is applied through them, which when removed resumes its position with a spring and a slap in the collars of the pins, and causes the crossheads to do the same on the guides. This injures the pins, crossheads and guides, the piston-rods and packing, as well as itself, and gives a motion to the rod that is the same as that caused by a bent crank-pin, and for the same reason, and that is emphasized. Where metallic piston-rod packing is used that fits the packing boxes loosely and gives no guide between the piston-head and pin, except that of the guide above the rod, defects in the brass bearing in either end of the rod caused by filing the faces or in boring the brass produces the same result in the rod bearings.

Another cause of trouble in the rod is misfitting liners that do not fit between the flanges of the brass on its full length. Keying upon them and the pressure of the power causes liners that do not fit to leave a shoulder. When the rod has been taken down and new liners put next the brass, or the old liners do not by accident fall into their old places, a new bearing is given on the back of the brass for the strap or key that will have the same effect upon the rod and brass as that caused by improperly filing the faces.

Most of the troubles in main rods that are attributed to bent pins, guides out of line, and other causes, can be found in the brass bearing being out of line with the rod, caused by improperly fitted faces, bad liners or brasses bored out of line.



FEED-WATER HEATER AND PURIFIER.

The New Baragwanath Feed-Water Heater and Purifier.

As will be seen, this heater is a combination of the well-known steam jacket feed-water heater and purifier, with an open heater. In this heater the water is fed into the conical distributor *M* at *G* either by gravity, city pressure or pump, and falls into the settling tank *I*, where it remains at a temperature of about 160° Fahr. for a sufficient time to permit the mud, sand or other impurities to settle. It is drawn off at *T*, and pumped into the closed heater at *C*, and flows to the boiler at *D*. The water flows over the conical distributor in a thin sheet, and is brought into direct contact with the exhaust steam, thus heating a large quantity of water very quickly. All the steam condensed in the tubes *J J J J* and steam jacket *P* falls into the open tank, and tends to freshen the water in it. At *U* is an overflow to conduct away the impurities, which rise to the surface of the water.

It will be observed by those acquainted with the original construction of this heater that the steam-jacket heater in this case is the reverse of the old style, receiving its exhaust steam at *A*, which passes downward through the seamless brass tubes *J J J J*, and upward through the steam jacket *P*, escaping through *B* to the air, or through a system of heaters for heating the building—boiling, bleaching, dyeing or washing, as may be desired. The high temperature attained in the heater (imparted to the water in the heater by its being entirely surrounded by steam) does not condense so much exhaust steam as would otherwise be the case; consequently, the exhaust steam passes off at a sufficiently high temperature to be of service for other purposes, and at same time heats water to the boiling point. At *Z* is a blow-off pipe to remove the sediment from the bottom of the closed heater; at *V* is one to remove from the bottom of the tank. The scum chamber *K* is provided with blow-pipes *H* to remove the scum which may arise to the top of the closed heater.

It will be seen that for breweries, cotton and woolen mills these heaters are especially adapted, as in the lower or open heater well water may be heated for washing purposes, while in the upper or closed heater city water for the use of the boilers may be boiled and purified, or the same water may be passed through both heaters—the open heater assisting the closed heater, and increasing its capacity for delivering boiled and purified water to the boilers.

These heaters are built by Messrs. Wm. Baragwanath & Son, Chicago, Ill. J. A. Crouthers, General Eastern Manager, 12 Cortlandt street, New York.

It was hardly to be believed that so many industrial establishments have been idle or running short time as the records of starting up or going on full time would seem to indicate. It is a satisfaction, however, to note that so many of them that have been idle or partially idle, are resuming their old-time activity. While, on the whole, increased activity is rather more noticeable in other branches than in machine shops, we think this is mainly due to the fact that more than average energy has been exerted to keep machine shops going through the dull times. Many shops have been run at little or no profit to keep men together; as times improve such shops will reap the benefit of having skilled help at hand.

The Reynolds-Corliss Engine with Wrought Iron Frame.

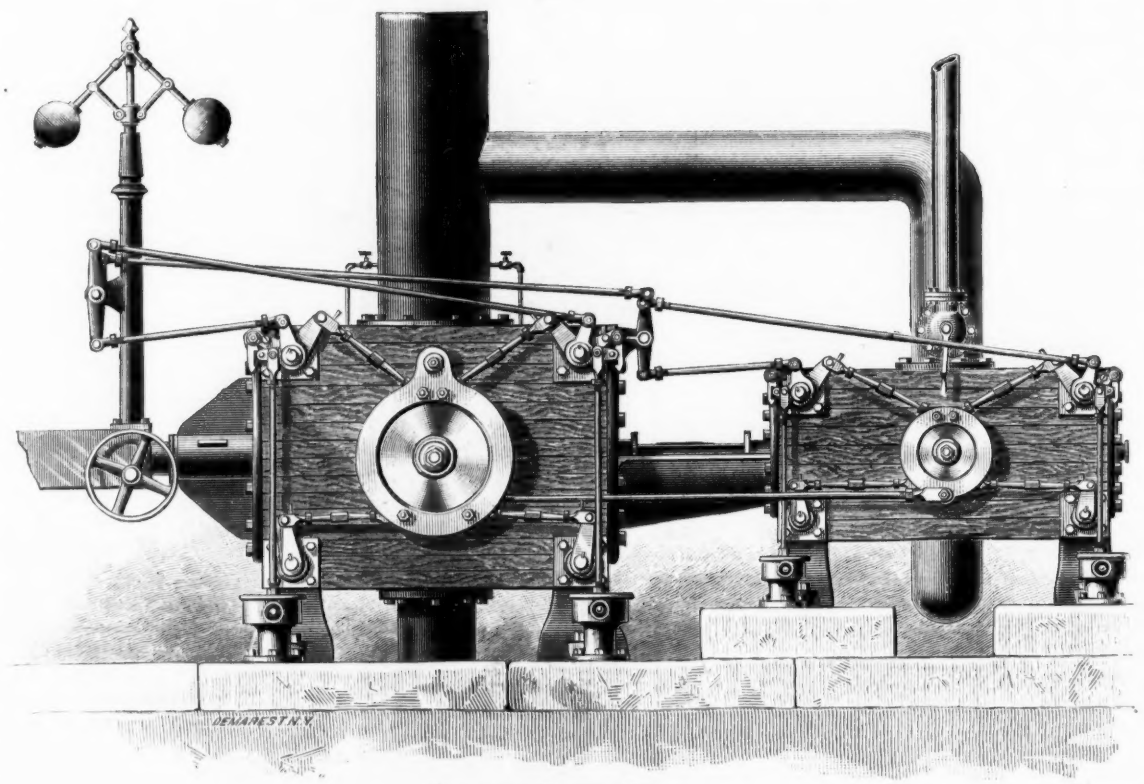
We give with this two illustrations of this engine, one with single cylinder and one compound tandem. As will be seen by reference to the engraving with single cylinders the pillow block is a massive casting concentrating great weight at this point, where it is most effective. The strain of working is taken exactly in its line of action by two heavy bars of hammered iron. These bars take hold of the pillow block at such a distance apart as to prevent side twist.

The guide bars are supported by a center pedestal; this pedestal is bolted to the foundation, and hence is effective to prevent spring in running either over or under.

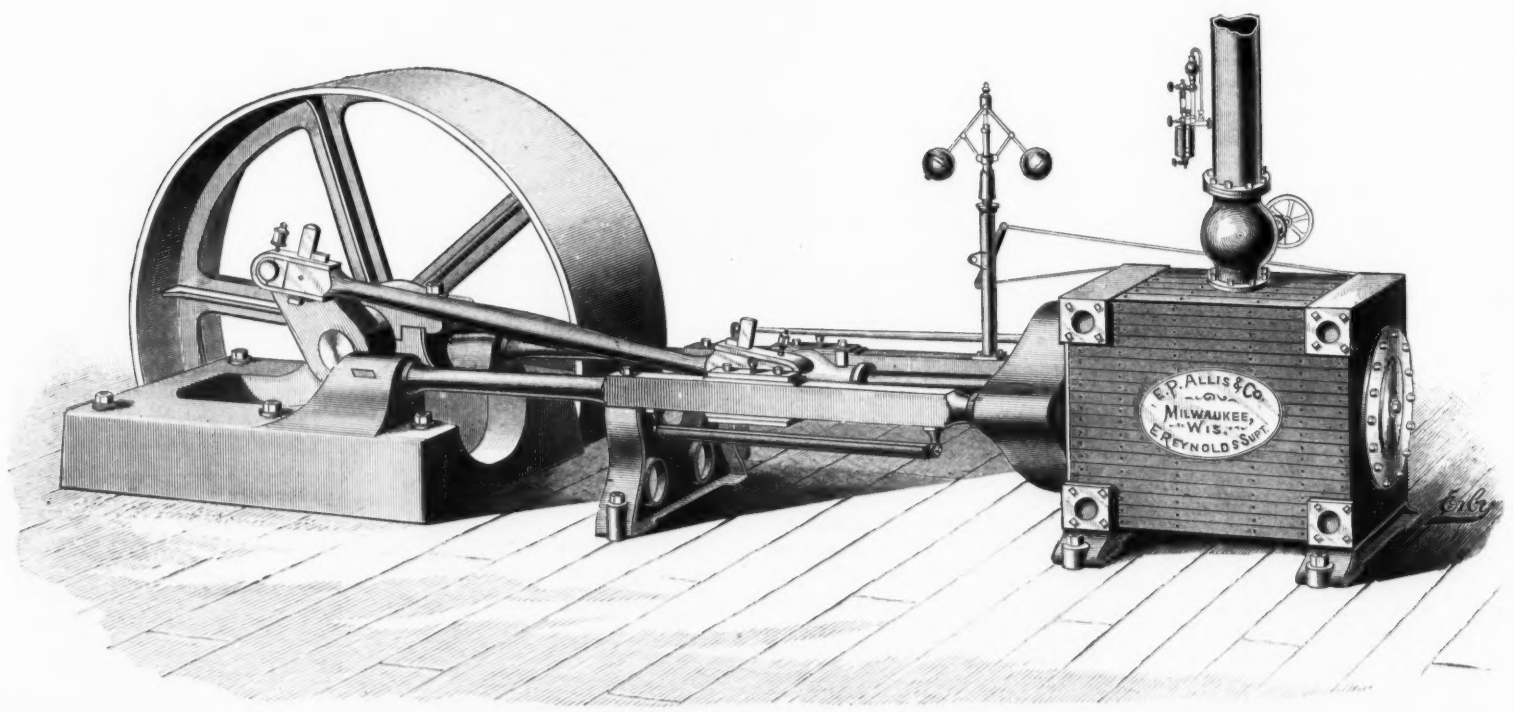
By this form of construction any desired strength to resist strains is provided; it also gives large wearing surfaces for crosshead, and accessibility to the parts. The strength that can be easily obtained makes this a desirable form of frame for compound tandem engines, as shown in the engraving, and in which the whole strain from the working of both pistons must be resisted in one direction. With this frame it will also be readily understood that any proportion of stroke to bore can be inexpensively made.

For the larger sizes double piston-rods are used, and in some instances the back extension of piston-rod; with the double rods a forged steel crosshead is used; this is a very strong construction, admitting of shorter and hence more rigid rods; the crosshead also gets a wide hold on the slides.

These engines are built by Edward P. Allis & Co., Milwaukee, Wis., and sold by Westinghouse, Church, Kerr & Co., 17 Cortlandt street, New York.



COMPOUND TANDEM ENGINE.



SINGLE CYLINDER REYNOLDS-CORLISS ENGINE.

Shop Notes.

Three of Snyder's men were tugging a ladle of iron. They had to carry it thirty feet, over a heap of sand, lots of flat-iron weights, a loose rammer or two, and lots of gaggers and nails. Bob's foot slipped, he fell. The hot iron splashed over him. The poor fellow was burned so badly that he died a few days afterward.

We all know the danger of projecting set-screws, unprotected pulleys and gears, but who ever heard a word said about carrying a hundred pounds of red-hot liquid volcano, over scrap heaps, dirt piles, and along dark passages?

"That's nothing, when a fellow's used to it," said Snyder, when somebody was complaining about the iron-carrying business. "A man ought to carry one hundred pounds of iron easy enough," and so the poor fellows had to go it along the dark crooked paths, between flasks, benches and loam piles; with hot iron blinding their eyes, and old rubbish playing tag between their feet.

Snyder didn't have any traveling overhead crane in his shop, so he had to put two or three big moulds right up around the furnace, and then lug the greater part of his iron to the further parts of the foundry.

When Snyder's men got a ladle of iron where it was to be used, they had to set it down and take breath before they could pour it.

The other day we were in Chipper's foundry just as the iron was coming down. Chipper has got an over-head traveling crane.

Chipper tapped out a ton of good iron in a big ladle. That crane picked it up, and walked right straight toward the northwest end of that big shop, and the iron went up, north and west, all at the same time.

There was a worm wheel attachment on the big ladle, the iron was poured into small three-man concerns, and the boys walked off with them.

See how fine Chipper has got the business down. Mike and Sam take the front end of a ladle. They don't take hold as Snyder's men do, with one hand each on the bar, and their arms crossed with hands resting on each other's backs. Not a bit. Mike picks up a piece of wood, shaped like the whiffletree to a wagon—a shallow notch is cut in the side. They put this wooden concern under the ladle bar, take hold with both hands, and walk off with that ladle like two lads carrying the front end of a stick of timber on a lever.

They don't stop to rest this time. Joe picks up an oak stick about 2′×6″, with a row of notches 6″ apart, cut on one edge. There are carriage bolts through the wood to keep the notches from splitting out. Joe sets one end of the notched stick on the ground, slips the rear end of the ladle-handle into the notch, which comes the right height, and keeps the thing steady and balanced.

Pat don't have to lift all he is able while he is pouring that iron. Mike, Sam and the notched stand hold the whole, and Pat pours the mould without wasting a drop of iron.

There are four of these moulds in a row, and the hot sprues make it rather hot for Pat's fingers. He can't stop, so John catches up a shovel, flips half an inch of loam on top of each flask, and saves Pat's fingers and cuss words.

Hovey was in a fix. He had been repairing a big transit instrument. He got along all right until the hole had to be reamed for the spindle. The spindle was four inches long and tapering. Hovey made a reamer just like his spindle, and began to ream the hole. When he got nearly down and the reamer was cutting its whole length, it began to chatter.

The hole looked as if it was lined with streaks of lightning. Hovey made a new reamer, and spaced the teeth unequal distances apart.

No use; it still chattered. Hovey sat down, lit his pipe and looked at that reamer. Pretty soon he got up, put the tap in the fire, took a "cherry" heat on it, and screwed the small end in the vise. He took a monkey wrench *and twisted that reamer* about 30 degrees; then he tempered it again, and ground it up to size. Hovey never had any more trouble with taper reamers. He can put a $1\frac{1}{16}$″ taper reamer five inches into brass without a shake or a chatter.

Iron and Steel for Various Purposes.

Mr. William Rose, of the Mount, Halesowen, in the county of Worcester, claims by his improvements, two metals, viz: cast steel and wrought iron bars or rods are amalgamated into a compound metal, and on being rolled and worked out together constitute merchant bars, strips or sheets. The old method of amalgamating or uniting together steel and iron was by placing finished rods or bars of steel and iron longitudinally side by side and over each other successively, until a billet is produced, which after being banded together by iron bands is heated to a welding heat, and rolled to the form and size required. Or small pieces of iron and steel are mixed together and placed in a heating furnace, and when at a welding heat the mass is united and rolled down into the required form of iron. In carrying out his invention he takes a mould of a size proper to form the required bloom hereinafter produced, and within this mould wrought iron bars are placed (to any number) vertically, or in the direction of their fiber, leaving intervening spaces surrounding each bar or series which is to form a part of the bloom to be produced, and into these intervening spaces between the said

bars, molten steel is run or poured, thus filling up the whole of the interstices or intervening spaces between or surrounding the bars. As soon as the molten steel surrounding the wrought metal bars has sufficiently set or solidified, it is removed when the ingot is cast as described. It is next heated and rolled or hammered down to any size required for the manufacture of chain, nails, rivets, tubes or any other articles which the metal is suitable for. The metal thus produced by the uniting or compounding of cast steel with wrought iron bars by the process hereinbefore described, is tough, rich in fiber, and will readily weld. Although he has described the in ot or bloom composed of cast steel and iron bars, as being rolled and worked out together into merchant metal, yet castings may be produced in the same way; that is, he takes as before a mould of the requisite shape of the casting to be made, and he places within this mould bars of wrought iron (to any number) divided by intervening spaces, and around and between these bars, molten cast steel is run, thereby producing a casting composed of combined cast steel and wrought metal. The wrought iron bars or rods act as sinews of strength to prevent the casting from breaking when subjected to severe strains.—*The Engineer and Iron Trades Advertiser.*

New Double Automatic Bolt Cutter.

The special feature of this machine is a simple and positive "straight line" automatic motion, consisting of a steel rod passing through the carriage and secured to the steel fork which operates the head and dies.

When the bolt has been threaded the desired distance the dies open automatically, and as the bolt is withdrawn, by bringing the carriage back, the dies by the same motion close automatically. The machine has a pump inside the column which keeps the oil pot three parts full of oil or alkali water, so as to constantly supply the dies.

The pan of the machine is so shaped that, as the oil or alkali water leaves the dies, it drains down into the column, from which it is again pumped up to the pot.

These machines are made in different sizes, the one shown cutting bolts from $\frac{1}{4}''$ to $1\frac{1}{2}''$ in diameter. It is a quick-working machine, and is recommended by the builders for railroad car shops, agricultural works, and wherever a large number of bolts are used. It is made by the Acme Machinery Co., Cleveland, Ohio.

New Sash and Blind Tenoner.

This is an iron-frame machine, with all the working parts, shafts, spindles, etc., made of steel. The cutter-heads are adjustable separately, or both at a time, by means of two adjusting screws. One screw raises and lowers the upper head to give thickness of tenon, and the other one raises and lowers both heads at once, to give depth of shoulder on either side of tenon, as required. The upper head is adjustable laterally, so as to square the shoulders, or to make tenon longer or shorter, as is necessary.

The cutter-heads used on this machine will cut $3\frac{1}{2}$ inches at one cut; longer tenons can be made by cutting twice.

There are two copes (upper and lower), which are easily adjusted. There is also a cut-off saw attachment for cutting tenons to exact lengths. The cut-off attachment is adjustable laterally by a hand-screw.

The cutter-head belts are given the proper tension by a weight pulley, gear and rack, and can be regulated to give any tension desired.

All the bearings are lined with best babbitt metal. The steps that the uprights run in are self-oiling. The spindles in these boxes are guaranteed to run from one to two months with once oiling. Manufactured by Frank & Co., 176 Terrace street, Buffalo, N. Y.

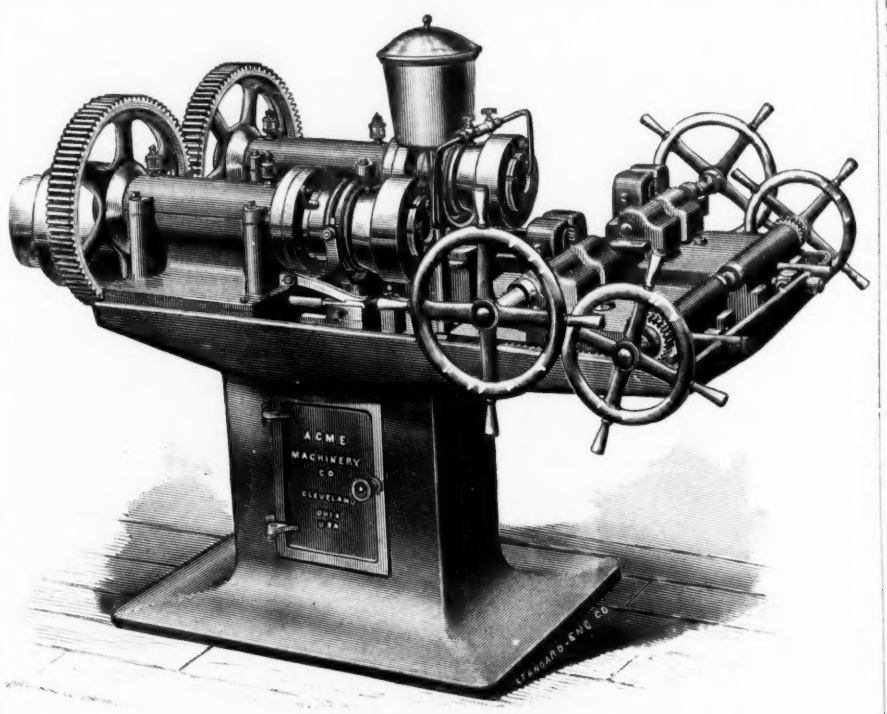
We are told of a Boston man who built two houses, one to sell and one for his own use, side by side. He placed a furnace in the house he sold, and connected it with flues to warm his own house. He worked the racket for about a year.

LETTERS FROM PRACTICAL MEN.

Fitting Keys—Tapping Holes—Annealing and Hardening Steel.

Editor American Machinist:

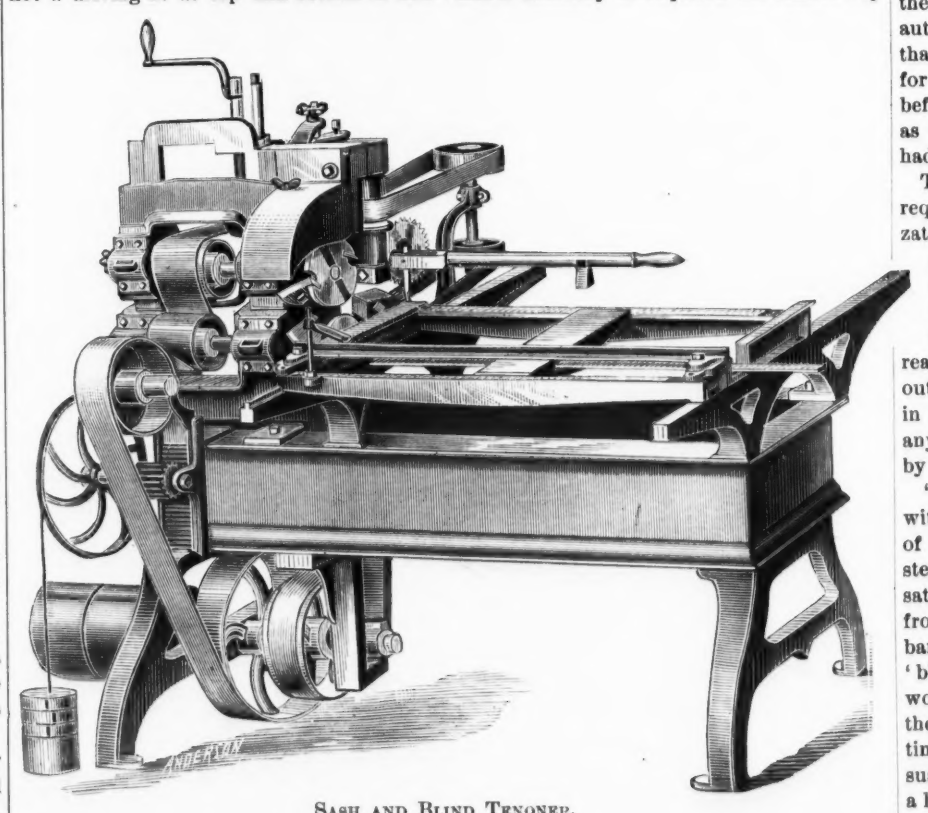
In the matter of fitting keys, driving keys, etc., about which much has been written, is it not apparent that for general instructions nothing would come nearer to the mark than this: Fit and drive keys with judgment. If the office of a key is to hold in position longitudinally, and prevent from turning on the shaft that which is keyed in place, without forcing out of true if the hole fails to fit perfectly, or in less degree by strain of



AUTOMATIC BOLT CUTTER.

metal no matter how good a fit may be had—even to driving—is it not evident that nothing can excel the fit of the key which bears in all directions, and especially in its bearing at top and bottom bears alike, practically, for its entire working length? To fit perfectly at the sides is of great value. To insure the utmost integrity of fastening, is not a driving fit at top and bottom in connection with the side fit a necessity? The worst feature in driven keys is that of acting as wedges, which bear only at one end, or for so small a portion of the length as to throw out of true whatever is keyed on by them. Fitted with judgment, with due respect for the necessities in each particular case, keys may bear all around, and need not throw out of true the pieces so keyed. If it is desirable to have coupling, crank, pulley or gear-wheel remain rigidly fixed, there must be not the least chance for working on the shaft, for the tendency will grow as inevitably as an indulged appetite.

Taps are expected to follow the direction of the holes drilled for them, by being coaxed, and punched, and crowded, this way and that, according to the judgment of the operator, aided by the use of a try-square and squint when practicable, and the squint alone when no suitable base is present for the try-square. "Pretty near." Who ever thinks of exactness in connection with this kind of tapping? In enlarging a hole after drilling, who expects that a larger drill will without guiding start in concentrically with the first drilling? Counterbores with teats fitting the hole to be enlarged are used in such cases, are they not? What insures the starting of a tap with no guide, more nearly correct than a drill can be started? Will not the inspection of tapped holes, with a full thread on one side, and half a thread or only a bare marking on the other side, show that if accuracy is required the easiest way is not by *coaxing*, but by *making* taps go where we want them to go?



SASH AND BLIND TENONER.

What queer things can be heard and read about steel if one only keeps eyes and ears open among the steel-workers and trade-papers. That steel can be entirely rid of its carbon by heating in an ordinary blacksmith's fire, or that by a succession of heats and hammering the percentage of carbon can be largely increased. That in annealing steel in boxes packed in charcoal, to let two pieces touch each other, instead of having the intended intervening layers of carbonaceous packing come between at all points, is to insure spots which will not harden. This very serious defect in steel, notably in taps, of having soft spots after hardening, is said to be the certain and unvarying result of careless packing for annealing. The proof offered of the correctness of the statement, by the high authority publishing it, is that many careful experiments have invariably shown the same result.

Queer, is it not? Let us look into the matter. That a bar of steel, which if cut in pieces and made into taps without annealing (which by the way is claimed by some to be the only way to get the best results), will harden thoroughly hard in all its parts, or if each piece when annealed by itself by heating separately in an open fire will harden equally as well, but if packed for annealing with alternating layers of charcoal so that each piece touches some other piece or pieces, the result will be that at each point of contact soft spots will be found which cannot be hardened, is a statement of alleged fact which naturally leads a practical man to ask, why? In the meantime while waiting for a thorough explanation of the whole matter by the high authority which has so readily published the statement, is it not in order to ask why the same rule should not apply to the annealing of wire in coil, or of coils of sheet-steel? Such coils are sometimes annealed in boxes, packed in charcoal, and still with all the points of contact between different parts of the strands composing the coils, there is no difficulty in hardening every part through the entire length of each coil.

Suppose a piece of steel which has on its surface the well-known decarbonized envelope that will not harden, to be centered and turned up for a tap, after passing through the annealing process, the centering being so defective as to only just skim the surface on one side, while a good chip is taken from the other side. If this tap when finished should fail to harden on one side as well as on the other, how easy it would be to say that that side which failed to harden had touched some other piece in annealing.

Of course it may be very disrespectful, but how can one help thinking that, with all the confidence shown by the old reliable authority, it has been imposed upon, and that if a lot of tap timber was to be placed for annealing, which would harden all over before the process, it would harden equally as well afterwards, even though every piece had touched other pieces.

That so great heat and so much time are required in the carbonization or decarbonization of iron or steel in a commercial way, affords good ground for reasoning upon the improbability of materially changing the hardening properties of steel by annealing at proper heat. It doesn't seem reasonable that the carbon should be driven out of steel by one piece touching another in the annealing process any more than that any great amount of carbon will be taken up by steel in working or annealing.

"Queer perversity of materials," may be with some an easy way to pass over many of the unwished-for results in the use of steel, as well as to notice some of the very satisfactory results which sometimes come from unexpected causes. "Sometimes a bar of the best cast steel will submit to a 'black annealing,' and be just as soft under working as though it had passed through the regular annealing-bath ..... and sometimes it requires all the coaxing and persuasion of an air-tight bed of charcoal, and a heating and cooling of twenty-four hours, to induce the steel to yield to working cold." Black annealing means simply the heating of the steel to a cherry-red, allowing it to cool in the air until it shows no redness in the shade, and then plunging it in cold water. Cold water annealing, this has been called, and for all that there is queer about it, one needs to look no further than to compare its effects *upon the same steel* with those of regular annealing, or going through the process up to the plunging in cold water, omitting that, and letting the steel cool off

thoroughly instead. Annealing consists in heating to a proper heat and cooling gradually. "Cooling in the air" is rather vague, since it might mean laying upon the ashes and pulverized coke, or charcoal on the forge in an atmosphere above blood-heat; or it might mean throwing upon the damp ground, or laying upon sow or anvil with the weather at freezing, or even at zero. "Plunging in cold water when no redness can be seen in the shade" is quite as indefinite, and for best results depends upon the imagination which sees redness longest, for there is not the slightest doubt, but the act of plunging is in some degree one of hardening, not of annealing, in no case leaving the so-called water-annealed steel as soft as it would have been without the plunging.

Another of the queer things in connection with the statement of alleged facts from which quotations have been made, is that "Sanderson's, Jessup's, and Wardlaw's steel were particularly amenable to this heroic treatment, being cut as freely as iron." Is it likely that the effect was different upon these steels from what it would be upon any other steels, either English or American, in which quality, carbon percentage, condition and treatment are the same in every respect?

The queerest part of the whole business is, that the manipulator can so readily blame steel for unpardonable perverseness, and so seldom see in his own treatment the cause for the queer pranks which so plague him.

The writer once saw a die six inches square by four inches deep, which, in use for drop forging, had been broken right down through its entire depth from the fact that the hardening had been only skin deep, and the bottom had sunk and acted as a wedge by which the die was burst asunder. The steel was fine and sound. To replace the broken die, the same bar from which it was cut was heated, and with chisel was cut from each side of the bar to within say, one-quarter to five-sixteenths of an inch of the center, leaving one-half or five-eighths of an inch to be broken when cold. Queerly enough, a stream of cold water was poured into the nick made by the chisel, to insure breaking off easily. How queer it was for this piece to split in two lengthwise while lying on the bench hours afterwards, was it not? Was it queer for the steel to be suspected of being a bad lot, and of being to blame for the whole trouble? Of course it *must be hard* to stand as a die for drop-forging tool steel, but then it *should have hardened*, and it *should not crack* at a little thing like a stream of cold water poured upon a part of it only when hot.

There was nothing queer about the die sinking, it was not hard. That the lateral pressure of the sinking part should burst the die was not queer. That a block of steel weighing some forty pounds should fail to harden at a dark red heat which would have been just right to harden a cold-chisel or lathe or planer tool of the same steel, was not queer. Nor was it very queer that the new die blank 6″x6″x4″ should split open lengthwise by a partial cooling, which set up unequal contraction. Is there any need of saying where the queerness comes in?

Is it not queer that so many people believe that steel is in no danger of being overheated in annealing or hardening if packed in boxes or heated in fused baths? "Could not get it too hot in a box!" "In the lead bath heating, the article to be heated may be kept an indefinite time in the hot lead without being burned, it will not get beyond the proper heat for hardening." Queer? Yes. And still there are those who, accepting such statements as true, have persisted in hardening small articles by heating in a fused bath to so high a degree as to literally ruin the work, bringing the pieces out of the quenching bath as brittle and as weak as pipe-stems, and laying the blame to the steel, until through some lesson which they cannot dodge, they learn that in spite of the lead, or salt and prussiate, or cyanide bath in which the heating has been done, the steel has been burned. "Did not suppose it could be burned in that way." Queer? Yes; very.

And about hardening. If a piece resists the effort to mark it with a file it is supposed to be hard many times, although the hardening is only skin deep. Says a successful steel-worker, who has a fashion of talking about himself as "Joe": "When I have steel that does not harden readily, I use prussiate or cyanide in that way cheating the file." It never cheats Joe, though, for he knows that aside from the mere skin of case-hardening, such steel is no harder than it would have been at the same heat without the physic.

One of the newest queer things which the trade papers are sending around, is the statement that when some 500 to 600 degrees of heat are required to draw the temper to any desired point in the ordinary way, from 200 to 300 degrees will accomplish the same end, if the heat is kept up for 24 hours. Why not ask us to believe that 100 degrees will do just as well, if the heat is kept up 48 hours?

S. W. GOODYEAR.

The Product of Mixed Numbers.

Editor American Machinist:

We have had the division and squaring of certain mixed numbers. There is one other wrinkle which I have never seen in print, and which rests upon the algebraic principle that the product of the sum and difference of two numbers is equal to the difference of their squares. It is the product of mixed numbers under certain conditions. Thus, if we wish to multiply $2\frac{3}{8}$ by $3\frac{5}{8}$, it is rather inconvenient to reduce them to $\frac{19}{8}\times\frac{29}{8}$, and then perform the required multiplication and division to obtain the required answer. It is also long and tedious to reduce them to 2.375×3.625, and find that they equal 8.609375, after which it is necessary to find out what fraction stands for this long decimal.

A little inspection will show that $2\frac{3}{8}$ and $3\frac{5}{8}$ are $3-\frac{5}{8}$ and $3+\frac{5}{8}$; hence, the product of these is $3^2-\frac{5}{8}^2 = 9-\frac{25}{64} = 8\frac{39}{64}$, all of which can be done mentally, saving much time, pencil and paper. This same principle may be used in common numbers; for instance, if we have 53×67, we see that it is equal to $(60-7)\times(60+7) = 3600-49 = 3551$.

C. L. REDFIELD.

Minneapolis, Minn.

"Smoke Prevention."

Editor American Machinist:

While reading Mr. J. S. Wilson's article in your issue of Oct. 17th, on "Smoke Prevention," the following explanation presents itself to me, which I venture to offer.

It is, that with the draught induced by a chimney, there is a partial vacuum in the furnace, which is increased by the resistance the close fuel offers to the air in passing through. But with the blower, the pressure being below the fuel, there is no vacuum, but an ample quantity of oxygen supplied to produce perfect combustion.

Raleigh, N. C. D. J. JUSTICE.

NEW TOOL HOLDER.

Back-Lash.

Editor American Machinist:

In reading question and answer No. 298, in your issue of October 24, 1885, I notice the question, "What is meant by back-lash?" Your answer is correct.

Back-lash is also a round-house phrase, and when so used means excessive compression. An engineer will come in and say, "My engine has too much back-lash [when he means excessive compression], and is very logy."

In the same way he will come into the round-house and say, "My engine is blind," when he means she is negative, *i. e.*, has no lead when the piston is on the center, or at the commencement of the stroke. I think the term back-lash originated by the valve having inside clearance, and as the valve passed over the center of the valve-seat, the steam blew back or lashed back into the other end of the cylinder.

GEO. SIEMANTEL.

"Making Tight Boilers Without Caulking."

In the AMERICAN MACHINIST, of October 31, appears an article by George Marshall, on this subject as contributed by Professor Sweet August 29.

Professor Sweet thinks it had not been thought of before, and Mr. Marshall thinks it came from the *Locomotive*, but does not say when he first saw it.

It was, however, put into practice some eight years ago by the chief engineer of the New Haven Steamship Company, Mr. Merritt, but was suggested to him by Mr. Louis Scherding, of the Quintard Iron Works, and put in the plans and specifications of the boilers built at these works for the steamship company about this time.

The same thing was published in Stephen Roper's "Use and Abuse of the Steam Boiler" five years since, to my knowledge, and for years before, for all I know.

I think it was discussed by the Master Mechanics' Association, and published in the AMERICAN MACHINIST in 1881, but am not sure.

RICHARD A. NIVEN.

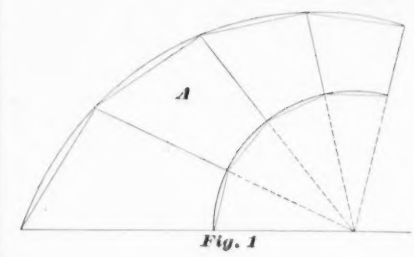


Fig. 1

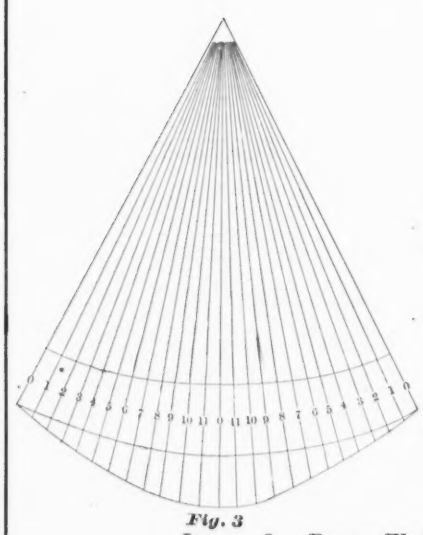


Fig. 3

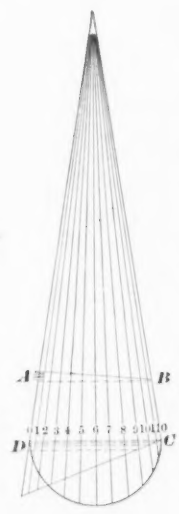


Fig. 2

LAYING OUT BOILER WORK.

New Tool Holder.

This handle is intended to take the place of a bit-stock in many cases where the latter is too bulky to carry or inconvenient to use. It has a square tapered socket, shown within the fractured shell, in which the head of the bit or other tool fits, and from which the shoulders project. The square hole in the cap is so proportioned that its sides are slightly less than the diagonal of the socket. It will hold any head larger than the socket, and smaller than the hole in the cap.

When the cap is unscrewed sufficiently for the head to pass entirely through it and rest in the socket, it may be turned down till the sides of the hole wedge upon the tapered shoulders and hold the tool centrally and securely.

Such a handle, fitting a large variety of tools, must, it appears, prove a valuable addition to the mechanic's kit, as well as the amateur's, and the household tool-box. It is manufactured by the Syracuse Twist Drill Co., Syracuse, N. Y.

Laying Out Sheet Iron and Boiler Work.

BY GEORGE MARSHALL.

SIXTH PAPER.

THE TAPERING GOOSE-NECK ELBOW.

The sketch presented in Fig. 1 is that of the most difficult piece of work I ever had to perform. It was intended for the top of a horizontal oil-still, and connected on the small end with pipe that led to worm, while the large end connected with a dome-shaped piece riveted to top of still. At that time (1868), I could not lay this out by lines, so I had a model made to scale, and from the model laid out the enlarged pieces. I was satisfied there was a rule for laying out work of this kind, and by close application finally succeeded in mastering the difficulty with satisfactory results.

A study of the sketch will show that each section is that of an improper cone frustum. In a former paper I treated of the true cone and frustum; this will enable me to present the views and methods of an improper one, as promised.

Fig. 1 represents a full-sized sketch of the elbow; Fig. 2 that of section marked *A* transferred full size with lines drawn to intersection showing cone form; the dotted lines *A B C D* show the true frustum form; above and below these are shown the variation between the proper and improper frustum. The other sections composing the goose-neck are laid out by the same method, so one description applies to all. The semi-circle is intended to represent the correct diameter of frustum at base; below it is shown a bevel end, hence fig. 3. while showing the lines of the true frustum, also shows the necessary additions made to it to produce a figure of the form desired.

Having drawn the half-circle already shown, divide into as many equal parts as may be desired, having a line in center as shown. From these divisions draw lines to intersect with apex as shown. The next step required is to lay a square on center line, and at each point of intersection draw lines to side of figure. The object of this is to get correct length at each point, as if you measure on sketch from apex to any of the points indicated, then measure from same point to the line carried to side of figure, a perceptible difference in length is noticed.

Next draw the outline of frustrum *A*, carrying side lines to apex, and with compass set at apex strike curved lines equal to circumference of figure as shown in fig. 3. Divide this into double the number of parts shown in half circle, fig. 2, drawing lines to apex as shown. Now from apex of fig. 2 set compass to line 1, 2, etc., transferring distances thus obtained to corresponding lines on fig. 3 until the distances of the entire number are transferred, and your figure will present the appearance of finished work shown in fig. 3. The top of frustum requires the same treatment as bottom, and the work is complete.

The seam in this section is placed on the short side; it may be placed at any desired point by an alteration of the numbers. The outline of fig. 3 represents centers of holes; an allowance for laps should be made.

This principle can be applied to conic sections where the base or small end is circular as well as straight, and a study of this will be of great assistance in laying out other work. There are frustums which cannot be laid out by this method, as the distance from apex to objective point may be too great to come within the range of an ordinary trammel. In a future paper I will explain how such work may be done.

Observations in a Machine Shop.

BY TANGENT.

THIRD PAPER.

SAM CARSON AND THE AGENT.

While Sam and I were talking, an agent came in and asked for the foreman of the shop. Sam said, "I am the man." The agent showed his card; you know the way they usually do. Sam's face began to get sour, but he kept his dignity, and told the agent that he did not do the buying for that shop, and what was more, he hadn't time to talk with him that day. Of course, the agent didn't take the hint, and Sam's dignity rose up enormously. He said to him—an old gentleman, by the way, who represented a prominent steel firm:

"You must have misunderstood me; I said that I hadn't time to talk to you; there is Mr. Bruiser's office and there is the door to the shop."

The man got red in the face, took up his overcoat and went out. Sam turned to me and said, "I make short work of these felows."

"I think you made a fool of *yourself*," said I.

"It seems to me," says Sam, "that you are finding considerable fault with the way I do business; if you don't like it, you know what you can *do*."

"Yes, I know what I can do; I can tell you what I think of it, and I propose to do it. That man came in here; he spoke to you like a gentleman, and you answered him in a way that does not show very good breeding."

"I answered him in a straightforward, concise and business way; I had no business with him, I don't do the buying, I do not want any steel, and if I did I couldn't have bought it. I had no business with him whatever; these agents are a nuisance anyhow."

"You answered him in an abrupt and uncivil manner. You may not have thought you had any business with him; you are always reading the AMERICAN MACHINIST to get information, yet there are traveling editions of AMERICAN MACHINISTS going through your shop every day, and you kick 'em out. I don't know that man, but I'll bet he knows more about steel than the whole boodle of you in your shop. Why, last month there was one came up to our place and spent the whole afternoon there. I couldn't buy any of his steel; in fact, I wouldn't if I could, because we have had experience with it, and we can get better steel for our purpose. But that fellow was smart; he knew what steel was, you bet. I took him over to the blacksmith shop, to the tool-dresser, and he showed *us* some things about steel that we—that is, the tool-dresser and I—never knew before. The foreman was not there; there was no need of him; I never saw the foreman of a blacksmith shop who could be shown anything about steel or could be interested in it. When he left he gave me a good cigar and a treatise on steel, and I enjoyed smoking the one while I read the other. As for being a nuisance, their business is just as legitimate as yours."

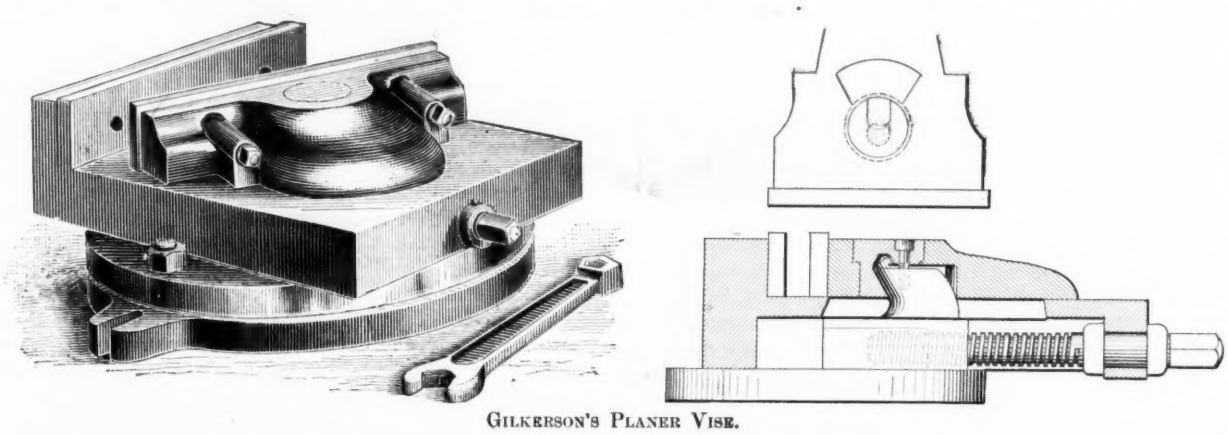
Sam couldn't see it in that light; he was down on agents anyhow.

As it was nearly time for my train to leave, I bid Sam good-bye and left. On my way down the street, I stepped into a place to get a cigar (I needn't have done it if Sam had only used that agent right), and who should I run against but Joe. He had evidently laid off, for he had his good clothes on and he had washed himself some, although the low-water mark was visible. Joe didn't recognize me, and I heard him tell some cronies of his how he had busted things that afternoon; they asked him what the Old Man said. "Say," said Joe; "you bet he didn't say much to *me*." I lit my cigar and passed out.

I'm going down to see Sam again one of these days.

Gilkerson's Planer Vise.

The construction of this vise is shown very clearly by the two engravings. It has a graduated base and swivel jaw, operated by a single screw. It will be seen from the sectional cut that the operation of screwing up the loose jaw forces it down to the bottom plate, hence thin pieces may be removed and replaced, and come back true.



GILKERSON'S PLANER VISE.

The head of the screw is made five-faced, so that the first wrench at hand, perhaps much too long for the purpose, will not be used instead of the proper wrench.

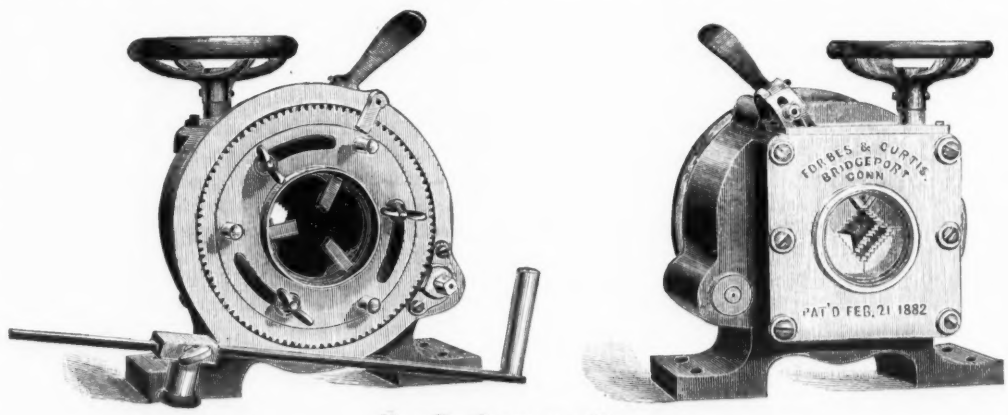
These vises are made in nine sizes, from 4" to 24" width of jaw, by the Gilkerson Machine Works, Homer, N. Y.

New Die-Stock and Vise.

The die-stock and self-centering vise herewith illustrated represent recent improvements by Forbes & Curtis, Bridgeport, Conn. The tool is complete, and requires only to be set on a bench to be ready for use.

It will cut pipe from $\frac{1}{4}$ inch to 2 inches inclusive.

The vise is entirely new in design, and calculated to resist the severe strains in making up fittings.



NEW DIE-STOCK AND VISE.

Spiral Springs.

BY JAMES F. HOBART.

Spiral springs are easily made "when you know how." Tom made some last Tuesday. He put an arbor in the lathe; put the wire into a hole in the arbor, started the lathe on a slow speed and held on to the wire. When he wanted an "open" spring, he measured the wire and found it made twelve coils to the inch.

He put on change gears to cut a pitch of six to the inch, snubbed the wire beside the tool post, and wound up all the nice springs he wanted.

Sometimes Tom will do the job without the screw-cutting rig. He just starts up for a plain, close spring, and holds a piece of the same sized wire between the coil on the arbor, and the wire as it winds on. If it troubles him by jumping out, he will bend it up like a hook, so it will just fit the arbor. If a very coarse spring is wanted, a thicker wire is used as a guide.

One day Tom wanted a small spring only $\frac{1}{10}$" in diameter, and it had to be 26" long!

Here was a "sticker." Where could an arbor be found to stand the racket and be only $\frac{1}{80}$" in diameter? The wire gauged $\frac{1}{40}$".

Tom took the tail-stock off a little old 6" drill lathe, and put a little chuck on the spindle. He hunted up some wire that gauged $\frac{1}{40}$", or .025". He bit one end of the wire into the chuck on the lathe and put the other end in a little ball bearing which could turn very easily.

Tom wanted his spring 26" long, but he must have 250 of them, so he cut his wire long enough to reach clear across the shop, about 20 feet. He set up the ball bearing, oiled it, and made sure that it would run very easily when the wire was strained up pretty taut.

Next, Tom got a piece of steel $\frac{1}{2}" \times \frac{1}{4}" \times 5"$. He drilled a $\frac{1}{40}$" hole in it to receive the wire arbor, and filed down the steel until it was $\frac{1}{8}$" thick where the $\frac{1}{40}$" hole went through. He filed down square and left a shoulder close to the hole. He then filed down again, leaving $\frac{1}{4}$" of steel between the two places. A small hole about .06," was drilled through the steel thus left, and the wire to be wound, was passed through this hole, and was guided by it. This steel also formed a bearing for the arbor. Tom got Jim to start and stop the lathe for him, and to see that the wire ran free from the reel, which was placed close by the lathe.

After the spring was wound, and the wire cut off, the spring uncoiled enough to loosen it from the wire arbor for about six feet from the end last wound. If the first wound end be cut, it does not "let go" the arbor, but hugs it tight. Tom don't cut this end yet. He reverses the lathe and runs it backward fifteen or twenty times, then slips the wire arbor out of the chuck, and carefully slides the spring off while Jim pulls gently on the arbor.

One day Tom was in a shop where they made indicator springs. He sat down on a nail keg and took it all in. The steel wire was all cut to length. A little round iron bead was slipped on the middle of the wire, which was put in the winder. A thread on the winder shank carried it forward, just enough to make the coils the right distance apart.

Next, they were screwed on a tool on which was cut a shallow, double thread, just the pitch the spring must have when finished. The spring was heated red hot while on this arbor. All strains were equalized thereby. The spring was hardened on the same arbor, and then the temper drawn by flashing off. They were tested and gauged by using more or less length, just as the hair spring of a watch is altered in length by bringing more or less of it into action by adjusting a clamp.

Saxon Industrial Notes.

Consul Geo. C. Tanner writes to the State Department from Chemnitz, Saxony:

There is a new and increased demand in this district for silk gauze (for use in the manufacture of paper) for bank notes. This process is said to be very difficult, but very ingenious. The extremely fine threads are of various colors, and are arranged in a peculiar order, by which the expert is able to discover spurious notes by observing that the colors do not maintain the arrangement of the particular loom from which the genuine notes of the special series have been produced. A bell attached to the loom is automatically rung if one of the threads breaks. I am not sure that this industry is known or was invented in the United States. Large orders for these tissues are constantly being received here from foreign Governments.

The petroleum lamp industry is one that I wish especially to call attention to in America, as I believe our manufacturers in this line might learn much to their advantage and profit by a study of German taste and style. These lamps are manufactured here, though Berlin is the principal manufacturing center, the value of lamps made at that place yearly being from 10,000,000 to 15,000,000 marks, only one-seventh of which are consumed in Germany. The remainder is for export, of which three-sevenths go to Russia, the same proportion to transatlantic countries, England, continental countries and the East. The workmanship of these lamps is worthy of all praise, and their cheapness makes them of quick sale. I think that our manufacturers in the United States would profit by a study of this subject from lessons taught here by German workmen in this industry.

German Patent Law.

Commercial Agent Smith, Mayence, writes to the State Department at Washington as follows:

The workings of the German patent law are not at all satisfactory or conducive to the interests of American patentees. The statute is very explicit in its provisions, and American inventors and patentees have the right, if they comply with its terms, to ask that the law be carried out; but I am sorry to say that it is almost impossible to get infringements punished, or even taken notice of. The law provides that the district-attorney where the infringer resides shall criminally prosecute on information furnished, but as patents and patent rights are surrounded by a multitude of technicalities the district-attorney almost invariably refuses to proceed, or pigeon-holes the complaint. The lawyers say that he is obliged to carry out the provisions of the statute, but the general experience of patentees is that he does not do so; hence the infringer is bold and openly defies the law, and the public conclude that the law can be broken with impunity.

This time it is the marine engine that must go. It is only a question of compressing air, mixing it with vaporized petroleum and firing it from cylinders through holes in the vessel against the water. The concussion, or impact, or recoil, or something else is to do the business. The stock company already formed has a capital of only ten million dollars, but then more stock can be issued.

The South is waking up to its natural advantages for paper manufacturing. The material for making paper seems to be in abundance there, and there is reason to believe that the paper-making industry will be pushed there during the next few years.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we reprsent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, NOVEMBER 14, 1885.

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Indirect Advantages of Invention.

Every year there are numerous mechanical devices brought out that are to "fill long-felt wants," and "revolutionize" matters in their particular line; apparently the wants are just as many as ever, and revolution progresses slowly. An inventor almost always makes more wants than he fills; the value of his invention is generally more in this fact than in the real worth of what he invents—in this fact and in the fact that it stimulates others to exertions. A few years ago the automatic cut-off steam engine was to take the place of all others; there are a good many throttling engines built in these days, and apparently always will be. That this is true does not argue any fault with automatic engines. Since the advent of automatic cut-off engines, great improvements have been made in throttling engines that have enabled them, for some purposes, to hold their own. But these improvements are largely due to the invention of automatic engines. The automatic engine cuts off short, and it was discovered that a plain slide could be made to cut off at half stroke, or shorter. The automatic engine governs closely, and this fact had a good deal to do with the invention of better throttling governors.

So it will be found in a hundred other things. If Smith or Jones makes an improvement in steam engines or printing presses, the world is chiefly advantaged in the improvements everyone else who builds steam engines or printing presses is moved to make to avoid falling behind in his business. The fact that some are progressive prevents the possibility of conservatism, in a bad sense, in the others; comparatively a few progressive men in any line of manufacture will keep all the rest alive to the necessity of progress. And this operates advantageously in two ways: Besides inducing progress in others, it prevents the possibility of anything like monopoly that will keep prices at an exorbitant figure. An instance of this is seen in electric lighting. Although a new field to almost everyone a few years ago, there have already been so many inventions relating to it, made by different individuals, that competition is sharp enough to keep prices to consumers low; and there is apparently but little danger of a combination that shall change this. A combination to this end would be sure, in its stimulating effect, to result in further invention that would defeat it. This invention in relation to electric lighting, in which hundreds have been and are engaged, was largely induced by the efforts and invention of one or two men, the indirect advantages of which outweigh many times over the direct.

Another instance of the influence of invention beyond what is originally intended, is seen in the steel industry. As soon as a beginning was made with Bessemer steel castings, and the "want" indicated, attention was turned to the subject, and at the present time steel castings of all qualities, and at comparatively cheap prices, are common enough to suit everyone, with the prospect that further efforts will better the product and reduce the cost. But the effect of the use of steel castings has already gone farther than this; it has had a good deal to do with improving methods of forging by which the product has been improved and the cost reduced; it has also had the effect to wake iron moulders up to the exercise of more judgment and study, that is, to make better iron castings than ever before, and to make them at less cost.

Instances like those mentioned might be multiplied indefinitely. Competition of this kind can be, except in some cases, depended upon to reduce and keep down prices and to further improve the quality of the product; an invention must be of startling novelty to insure the inventor being allowed to quietly gather abnormal profits for any great length of time. Something new, or the adaptation of old means, is reasonably sure to interfere with any plans in that direction. Many times inventors have a false sense of security in their ability to control prices, but an unpleasant awakening is reasonably certain to follow. Their rewards are likely to be fair, but not disproportionately great.

Trade Prospects.

At the present writing we see no reason to modify the opinions we have frequently expressed of late to the effect that the worst of business depression is over. There are from all sides evidences of a slow mending that promises good results. We do not base this upon reports from any particular locality; our advices are from every part of the country. In some localities there is an ill-timed impatience at the slowness of the mending. It need not, and should not, be expected that business is to mend rapidly. It is better that it should not do so. Rapid mending generally means that manufacturers are taking chances likely to result in disaster, and that will end in putting recovery further away. What is desirable is a slow and cautious advance, with solid ground behind.

In the textile industries great advances have been made—perhaps in some instances unwarrantable advances. In machine shops and machine manufacturing industries the advance has, we think, if slower been surer. The advance is not entirely general; some have felt it, while with others it is hardly noticeable, but it will come to all. Patience and push are both needed in times like these. Those who go too fast are likely to fare as badly as those who move too slowly.

In the meantime manufacturers will do well to consider the openings for trade with Mexico and South America. We are satisfied that there are prospects in these localities that are worthy of more attention than they are receiving. American manufacturers should control these markets. Whether or not they do so will depend mainly upon the exertions they make.

In China and Japan there are opportunities in railroad building and in railroad supplies that should not be neglected. There is good reason to believe that railroad enterprise will develop rapidly in these countries, and early efforts are desirable.

The iron making and manufacturing industries of the country are every day getting into a more satisfactory condition. Furnaces are gradually going into blast, and iron works are starting up. In steel rails the demand is beginning to be felt, and the prospects are that there will in the future be some profit in this industry.

With better times in any branch of business, those connected with it have more money to spend, and this makes better business in other branches. On the whole we congratulate every one on the prospects of better times, which shall bring better profits to manufacturers, and better pay to workmen.

The agitation in Britain against the long hours railroad employes are required to work, is likely to result in some good there. Investigation has shown that not only are the hours long, but that men are employed continuously for what ought to be two or three days' work, employed until entirely worn out, and then after scant time for rest are put on duty again. There is, perhaps, nothing of the kind in this country that will equal some of the worst cases brought to light there, but there are cases here that would bear investigation. It cannot be assumed that the hours a railroad employe shall work is something of interest only to himself and the company, for, on the contrary, it is something every man who travels by rail has a very material interest in. Railroad work, especially train work, is exacting in its nature, and there is an urgent necessity that every man on duty shall be at his best, with every sense alert to insure safety. This is something that belongs by eminent right to the traveling public. Men who are worked long hours cannot have their senses under proper control. The strain is too much for human nature, and what is commonly laid to carelessness or incompetency is frequently the giving way of the powers of endurance. Getting along with fewer men, by overworking those who are employed, should not be permitted, even if the men are satisfied with such an arrangement. It is a plain case for legislation, and, as previously intimated, while the practice is not common in this country, there are some roads where there is too much of it; eighteen or twenty hours continuous duty in railroading, or more than half of it, ought, except in extreme emergencies, never to be permitted. Every other consideration, even that of making money, should give way to that of safety.

A Water-Works Epidemic.

We hear frequently of certain diseases as being rife in certain localities. It is worth while to note the existence of an epidemic of a pleasanter character, which just now appears to be prevalent all over the country. We refer to the establishment of water-works, now under way or talked of, in hundreds of (in some instances even small) towns.

Sanitary science teaches the intimate relation which the water we consume, has to the public health under any given circumstances. But when it is considered that so many towns are rapidly outgrowing village or hamlet proportions; that in time large numbers of families find themselves elbowing each other on adjacent 25 or 50 foot lots, often bringing wells and cess-pools into perilous nearness to each other; then it is that the need of water and sewage improvements is forced upon the attention of the more thoughtful and enterprising citizens, and practical steps are taken toward accomplishment of the desired results.

Fortunately, the hydraulic engineer of the period is with us in our need. Fortunately also, the conservative and pull-back-if-you-can sentiment does not control the greater number of American communities. As a result we find an unprecedented activity in the establishment of village water-works all over the country, present and prospective, with promise of even greater activity in the future, as public attention is directed to the subject.

All of which the machine trade duly appreciates.

The Reading Habit.

The formation of habits is sometimes an easy and sometimes a difficult matter. Some habits seem to have a sort of spontaneous tendency, and almost form themselves. Others need attention and guidance.

The habit of reading trash is one that most people find easy. Getting out of the desire to read trash, and getting into the way of reading something which the mind can welcome as being both interesting and instructive, is a process that requires both time and patience.

Where total disinclination exists, of course nothing can be done. But there are thousands who feel just enough dissatisfaction with their present status, that, without resolutely setting about it, they feel like doing something to elevate their ways of thinking. To such the formation of what may be called "the reading habit" affords about the best possible means. The thinking habit is one that may generally be expected to come later.

Hours of leisure many of us do not have in abundance. But all of us have moments of leisure, however hardly worked we may be. The temptation to let evening after evening slip by, without exacting from it any toll in the way of useful reading or thinking, is one from which many persons find it difficult to be delivered.

It is the first step which is hardest. Give the mind opportunity to call in the aid of habit, and, if you cannot form the desired habit all at once, move in the right direction as far and as rapidly as you can. In time habit will do something, and inclination, aided by habit, will be able constantly to do more and more.

But let no one be deterred from making a beginning, because he cannot see in advance just what benefit he will realize. The greatest opportunities for improvement and advancement are sometimes those which at the start seem most indefinite.

The lecture course of Cornell University, so far as engineering is concerned, is evidently to be an excellent one this year. Amongst those who are to lecture we note E. D. Leavitt, Jr., Chas. T. Porter, J. C. Hoadley, Charles E. Emery, and R. W. Raymond, an unexceptionable array, the first lecture of the course being by J. C. Hoadley, October 30; subject "Heat Energy, and Modern Fallacies."

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(315) J. R., Leominster, Mass., asks: Can you tell me why the Corliss and other releasing valve gear cannot be used on locomotives and high speed engines? *A.*—You will find this discussed in the AMERICAN MACHINIST of January 31 and February 28, 1885.

(316) F. C. C., Guilford, Conn., asks: 1. What is the name of the acid used in detecting counterfeit gold coin? *A.*—Nitric acid. 2. Is it best to pour brass hot or cold to avoid shrinking? *A.*—Brass should be no hotter when poured than to secure sound castings.

(317) J. W., Vallejo, Cal., asks: A screw has eight threads in 15-16″; what pitch is it, and how do you find it? *A.*—We should divide the distance by the number of threads. Thus, 15-16÷8=15-128, the pitch in fractional parts of an inch. You can only comprehend an answer to your other question by studying the higher mathematics.

(318) B. W., Plainville, Conn., writes: A tank 7 feet high and 8 feet diameter is to be kept half full of water by a pump that stands 2 feet below tank. Which will take the more power, to run the pipe in at bottom of tank, or to carry it over the top of tank? *A.*—It will require the more power with the pipe delivering over the top of the tank, because the column of water the pump must sustain will be higher. The size of the column has nothing to do with the question.

(319) C. B., Fort Wayne, Ind., asks: 1. Can I run an engine 2½″x3″ 300 revolutions per minute with a vertical boiler having 8 feet of heating surface and holding 7 gallons of water; boiler pressure 100 lbs.? *A.*—By using the exhaust in the stack you may probably succeed; 2″x3″ would be better size for the engine. 2. Of two boilers, one with 8 feet heating surface and holding 7 gallons of water, and the other having 9 feet heating surface and holding 20 gallons of water, which should run the larger engine? *A.*—The one with 9 feet heating surface and 20 gallons of water, other things being equal. Seven gallons of water is rather small allowance.

(320) F. S., Waterbury, Conn., writes: In making a worm-wheel for a worm 1 5-16″ diameter, 5 pitch, the wheel to have 80 teeth, I turned the wheel 5 1-16″ smallest diameter, and finished with a hob 1-32″ larger. I used a bolt that filled the hole in gear, the bolt in place of the tool-post, being particular to have the gear blank level, and held so as not to shake. When finished, the teeth were cut under and of bad shape. Can you tell what the trouble was, and was the gear the right diameter? *A.*—There may be a fault in the shape of your hob; you may have held the gear too tight. We have no means of knowing this. A very fair job may be done in the way you speak of by roughing out the teeth in the gear cutter and then finishing with hob. We should turn the smallest diameter of gear 5 1-16″, full.

(321) J. J. L., San Francisco, Cal., writes: 1. I notice in the AMERICAN MACHINIST of Oct. 17, the area of a tank 8 feet diameter is given 7238.24 inches. I make the area of an 8-foot circle 5026.56. Please explain. *A.*—The area of an 8-foot (96″) circle is 7238.24 inches, as given. You are evidently confusing feet with inches. The area in feet is 50.2656. 2. How long will it take to pump a shaft 8x6 feet, 225 feet deep, with a pump 10″ diameter and 24″ stroke, making 18 strokes per minute? *A.* The contents of the shaft are: 6×8×225=10,800 cubic feet. The area of pump barrel is 78.54 inches, and displacement of plunger 78.54×24=1884.96 cubic inches, equal to 1884.96÷1728=1.09 cubic foot. It will take 10800÷18=550 minutes to empty the shaft. Add 20 per cent. for loss from not filling the pump, and 550+110=660 minutes will be required. This is on the supposition that the pump is single-acting. If double-acting only half as long a time will be required.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

T. M. Parker, Steel Stamps, Stencils, Hart'f'd, Ct.

J. Clayton, Air Compressors, Rock Drills. 43 Dey st, NY

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Tack, Wire, and Shoe Nail Machinery; Wm. A. Sweetser, Brockton, Mass.

Tack and Wire Nail Machinery, made by the Willets Mfg. Co., Providence, R. I.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

R. Dudgeon, 24 Columbia st, New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Patent attorney and expert. Machine designs and details. Wm. H. Weightman, 82 Astor House, N Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Drop presses, and other special tools, manufactured by Williams, White & Co, Moline, Ill.

Improved Labor-Saving Upright Drills. 20 in. to 30 in. inclusive. Currier & Snyder, Worcester, Mass.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Nov 7 p. 14. Send for circular No. 17, Curtis Reg Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Kellam's Pressure Regulator—used in heating system of 11-story building, Madison ave., N. Y.,—saved, last season, $2,000 over previous season. Hine & Robertson, 12 Cortlandt street, New York.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

MANUFACTURES.

Columbus, Ohio, wants a new pumping engine.

A flouring mill is to be built at Hillsboro, Tenn.

A flouring mill is to be built at East Springfield, Pa.

The Montgomery, Ala., Water Works Co, are to improve their plant.

A soap factory is talked of in Selma, Ala. Geo. O. Baker is interested.

The Lickdale Iron Co., Lebanon, [Pa., is about ready to make steel plates.

The Columbia Iron and Coal Company has been chartered at Pittsburgh, Pa.

The Cleveland Ohio, Tack Co. are fitting up the old Novelty works for their business.

The agents of all Lowell cotton mills have agreed to adopt the weekly pay system.

The Metropolitan Electric Street Railway Co. has been incorporated at Detroit, Mich.

G. W. Richardson, Mobile, Ala., is fitting up a new shop for boiler and tank work.

G. W. Smith, Lexington, Ga., has bought a steam gin, and will add a saw and grist-mill.

The town of Woodbine, Md., is offering inducements to any one who will establish a mill there.

A combined grist-mill, saw-mill, and planing-mill is being built at Millboro, Ala, by Gillespie Bros.

A. J. Moor, Hartland, Maine, is rebuilding his lumber mill, which was burned some months since.

The Minneapolis and Northern Elevator Co, are to build a machine shop at Crookston, Minn.

The town of Searsport, Maine, offers special inducements to any one who will establish a shoe factory there.

Anderson, Ind., has voted to have water-works. No arrangements have yet been made to build them. The Mayor will answer inquiries.

The Stowell Manufacturing Company are erecting a large factory at Putney, Vt., in which to manufacture toys and other articles made of wood.

The Atlantic Works have erected at their wharf in East Boston large iron shears, having an overhang of 30 feet, and capable of lifting 150 tons.

The *U. S Sewing Machine Times* says: "The demand for sewing machines is just now taxing the utmost resources of many of the best and most popular concerns."

S. W. Goodyear writes us from Waterbury, Conn.: "Business here is improving in many departments, although it is still far from what can be called running up to full capacity generally."

I. W. Colburn & Co., Fitchburg, Mass., have issued a vest-pocket edition of their catalogue of machines and lamps for electric lighting. Small as the book is, it contains several useful tables for engineers.

The Manhattan Hardware Company, formerly located in New York, have removed to Reading, Pa., where they are erecting large works, including machine shop and foundry, the whole works and yard occupying ten acres.

Atlanta, Ga., is clamoring for a bottle factory. It is the center of a large patent medicine production, and also brewing and other bottle-consuming interests. The Swift Specific Co. offer to take a large amount of stock.

The Pacific Iron Works, San Francisco, Cal., are pushing foreign business, especially with Australia, where they are sending their copper smelters; also horse powers. This company has also a good South American trade in mining machinery.

Bodmer & Hürlimann, of Zurich, Switzerland, will establish a branch [silk] factory at New York on January 1, 1886. They have leased one floor, with the privilege of leasing another, in the new mill of Jacob New.—*Journal of Fabrics.*

There is a movement on foot at Woonsocket, Da., to organize a joint stock grain and elevator company among the farmers of that section. The company will have a capital of $5,000, and will likely erect an elevator at once.—*Northwestern Miller.*

William Skinner & Son, of the Unquomonk silk mill at Holyoke, Mass., are to build another mill 120 feet long and 34 feet wide on the upper level canal, west of their present mill, the work on which will begin at once. The plans are being drawn by Cain & Kilburn.

The Mexico-American Supply Co., headquarters at Louisville, Ky., is the name of a company organized to facilitate trade with Mexico in the way of machinery and manufactured goods. J. M. Robinson is President, and W. O. Harris, Secretary and Treasurer of the company.

The following orders on hand, by the Babcock & Wilcox Co., 30 Cortlandt street, New York, of water-tube boilers, seem to show an improvement in business: For Cuba, 1,694 horse-power, 917 horse-power of which are second orders; for various parties in this country, 3,348 horse-power.

A Southern correspondent writes us: "If you see it going the rounds that Charlotte, N. C., is going to have an electric street railway, don't you believe it. It is a huge stock-jobbing scheme that fell through; but Atlanta, Ga., is investigating the merits of electricity an a motor for street cars Walter T. Forbes has a motor on exhibition.

I. P. Richards, manufacturer of tools for cold punching of plate iron and steel used in boiler, ship, and bridge construction, has built and just moved into a new shop on the corner of Pemberton and Beaufort streets, Providence, R. I., and has recently issued an attractive circular illustrating the various styles of punches and dies made by him.

The Buster Mfg. Co. have purchased a piece of land on Preble ave., Alleghany City, Pa., 200 feet wide, and extending back to the Ohio river, on which they will immediately erect a building 100 by 175 feet, to be used as a foundry and finishing shop. They have promised to place $75,000 worth of machinery, and employ a large number of men.

The Oneida Steam Engine and Foundry Co., Oneida, N. Y., manufacturers of lathe and drill chucks, write us: "Our orders this month have been very good, so that we are running full force and full time, and about three weeks behind on our orders. Our foreign sales in September were larger than ever, and the outlook at home for a fair trade this winter is good."

The Brooklyn Bridge authorities have contracted with the Dickson Manufacturing Co., of Scranton Pa., to build two new switch engines for $4,500 each. There were five bidders. The contracts for the cars will be closed in a few days. They are to be of a somewhat unique pattern, having doors at the sides in the center as well as at the ends, so that a car can be emptied twenty seconds quicker than at present.

The dimensions of the buildings to be erected by the Somersworth Machine Company at Dover, N. H., which we have previously noticed, are: Foundry, 200x50 ft.; core room, 40x42; sand room, 30x20; iron house, 30x120; carpenter's shop, 34x100; machine shop, 67x232; boiler house, 37x40; bobbin shop, 67x163; two store sheds for lumber, 40x130; two dry houses, 22x40. These buildings will be of brick and first-class in every respect.

The E. Horton & Son Company, manufacturers of chucks at Windsor Locks, Conn., inform us that a marked improvement in their business began in August last, and has held on well, business now being good, with favorable outlook. Foreign trade forms quite an item of their business. They notice that their orders come from all over the country, and from a much larger number of customers than used to be the case.

A manufacturer named Fay from Northboro, has bargained for the water privilege at Blanchardville (Palmer), Mass., for making rubber shoddy. The tract in question is understood to include the property lying between the old counting-room of the Blanchards and the limit of flowage of the old dam. A building is talked of on the site of the old scythe shops, about 150 by 50 feet with two stories, supposed to make room for the employment of 50 hands.

The Portland Flour Mill Co. will build two steam elevators in the Palouse Country, one at Moscow, Idaho, and one at Pullman, W. T., both on the newly extended branch of the Oregon Railway & Navigation Co. They will have a capacity of 50,000 bushels each. Wheat will be shipped in bulk to the mill at Albina, Oregon, and this will be the inauguration of the movement of shipping in bulk to Portland, Oregon It may be followed by the construction of large elevators in that city, where grain for foreign shipment will be sacked and all other handled in bulk.—*The Milling World.*

A device enabling cable cars to pass intersecting cables is shown at the Novelties Exhibition, Philadelphia. The design is by H. B. Whittaker, 446 North Twelfth street, Philadelphia. It is attached to the car by means of three sprocket wheels. The cable engages each wheel in turn, disengages its arms from the grip, and passes the wheel precisely as a person passes a turnstile. As the cable leaves the wheel, after passing, it brings another arm in contact, to sustain the grip. Two of the sprocket wheels are connected, the third is connected with the grip lever, and the grip is actuated through the arms of this wheel.

The Chicago *Industrial World* says: "The Blair and Miller Manufacturing Company has just been organized with a capital stock of $500,000 for the manufacture of a full line of sporting goods. Mr. Blair is of the late firm of Felix, Marston & Blair, and Mr. Miller of the firm of Spalding Bros. & Co., of this city. The factory, which was formerly located at Hastings, Mich., will be combined with works of the new firm, and will be located in the Wilson sewing machine factory building at Grand Crossing, Ill. This building will be remodeled to suit the requirements of the new concern, which expects to be in full running order by January 10th next.

M. Welch, head miller for Mills & Houlton, at Elk River, Minn., was in the city over Sunday, and attended the dedication of the Millers' monument. Mr. Welch's firm, having a larger trade than they can now supply, have decided to erect a 500-barrel mill next year, and into his hands has been given the matter of looking up systems and machinery, and determining what kind the new mill shall be fitted up with. It goes without saying that only the best of everything will be used, as the mill is designed to be as complete as any in the State. Water and steam power will be employed in conjunction. The firm already have water-power sufficient to drive a 300-barrel mill, but an engine will probably be put in sufficiently large to manufacture nearly the whole 500 barrels, that emergencies, such as low water, accidents, etc., may be provided against.—*Northwestern Miller.*

The following is from a report by Consul Williams, of Rouen, France: "The immense factories of America, and those recently constructed in England, produce such large quantities that the general expenses are very much reduced. French capitalists are afraid to invest in such undertakings. The Singer Company manufacture 606,000 machines a year, with tools that cost 60,000,000 francs. Wheeler & Wilson, 350,000 machines, with an apparatus of 28,000,000 francs. The Howe Company and several others manufacture also enormous quantities. Since the new general tariff of customs favors the introduction of foreign machines into France, these three powerful American companies have established factories at Glasgow, where they employ several thousands of workmen. They have by this arrangement avoided the cost of transport to Europe. This is the reason that in the table the United States exported 36,190 kilograms, while England appeared with 1,477,043 kilograms."

Fay & Scott, Dexter, Me., have recently perfected several notable improvements in snapdragons, for sawing short lumber. The new machine has an ingenious automatic feed, and a gauge capable of being almost instantly adjusted to 1-16 inch and firmly held in its place. It also has an attachment for sawing clapboards from small logs, the chief feature of which is that the table supporting the bolt to be sawed is alternately raised and lowered by means of cams, so as to saw the clapboards without shifting ends of the bolt. Business is good in the shops of this live firm. They have just completed, ready for shipment, two 4-ft. snapdragons, of the style mentioned above, and are now building two automatic gauge lathes. Last week they shipped a wood lathe to Louisville, Ky., and this week they ship one to the State Prison at Thomaston, making three they have sold thus far to Maine State institutions. They are also doing something with their special turbine water-wheel, having sold six of them recently, and are furnishing the castings for a thousand pendulum churns for the Vanceboro Woodenware Co., Bangor.—*The Industrial Journal.*

H. L. Horne is building a new mill at Steep Falls, Maine, on the Saco, on the site of the old one recently removed. It will be two stories high, and is to be occupied by George W. Holmes as a wood-working and fitting shop.

Machinists' Supplies and Iron.

NEW YORK, Oct. 29, 1885.

There is nothing new to note in the general condition of the supply business. The better feeling of the last few weeks is maintained. Money is finding its way out of banks and into useful enterprise, and this is having a sure but slow effect on trade in general.

Iron—The market for American pig is substantially the same as last week; sellers are, if anything, more confident of their ability to maintain and eventually to advance prices, and are not disposed to grant concessions. In forge iron the demand has been considerably more active, and lots for immediate delivery have not been so readily obtainable. No. 1 X Foundry is quoted at $18 to $18.50 for standard brands; No. 2 X Foundry, $16 to $16.50; Grey Forge, $14.00 to $15.50.

Scotch Pig—There is no activity in Scotch brands. We quote Coltness, $19.50 to $20; Glengarnock, $18.50 to $19; Gartsherrie, $19 to $19.50; Summerlee, $19 to $19.50; Eglinton, $17.50 to $18; Langloan, $19.50; Dalmeilington, $18 to $18.25.

Lead—There has been a further decline in prices of pig. Sales have been made at 3.95c., but buyers are not disposed to buy with any freedom, even at this figure.

Copper—Dealers are making efforts to maintain prices, but they find but little demand. Lake has sold in small lots at 11c.; other brands, 10¾c. to 10¾c.

Tin—The market has ruled slightly in favor of buyers. Jobbing lots of Banca have sold at 20¾c.; Straits and Malacca, 20.45c.

Spelter—Refined, 5¾c. to 6c.

Antimony—Hallett's, 8.50c.; Cookson's, 9½c., with sales at slightly lower figures.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Situation as foreman of machine shop; good references given. Address Buckeye, AM. MACHINIST.

Wanted—Situation as tool-dresser, by a first-class workman. Address Durability, Box 126, Utica, N.Y.

Wanted—By a young man, situation as foreman of machine shop, or to take work by contract. Address Tact, AM. MACHINIST.

Wanted—Position as foundry foreman; 26 years' experience as moulder and foreman; mixing car-wheel iron a specialty. Moulder, AM. MACHINIST.

Wanted—Situation by a practical machinist; has had experience in mechanical and civil engineering. Address R. S., AM. MACHINIST.

Wanted—A thoroughly practical foundryman to take charge of a foundry engaged upon railroad and general castings, in Western Penn. Address "Foundry," AM. MACHINIST.

A young man of 25, technical graduate, wishes position by Nov. 15; has had practical experience in shop work, and some in selling and erecting machinery; lately drafting, but desires less sedentary employment. M. H. J., AM. MACHINIST.

Wanted—A situation as foreman of boiler shop; has a thorough knowledge of the business; knows how to work men and tools up to their full capacity; can make drawings and estimates correctly; can refer to former employers in above capacity. Address B. S. F., AM. MACHINIST.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

For Sale—Half-interest in a good Jobbing Foundry. For particulars, Address W. J. Ferrell, Coshocton, P. O., Ohio.

To make room for larger tool, will sell cheap, for cash, a planer 42"x42"x12', in good order. Address P. O. Box 2085, Bridgeport, Conn.

Light machinery of all kinds built at short notice. Good workmanship guaranteed. Pennington & Mills, 8 Dey st., Jersey City Heights, N. J.

Wanted—A good second-hand 60" lathe, to take 16' between centers. Address, with particulars, A. B. Bowman, 1101 N. 2d st., St. Louis, Mo.

For Sale—A Tabor engine indicator; used only three times; springs 20, 40, 60; all complete; will sell cheap. Address Box 109, Manistee, Mich.

For Sale—Stock, tools and lease of small foundry near Philadelphia, in running order; only small capital required. Address Iron, AM. MACHINIST.

Patented steam-valve movement for steam pumps. The undersigned desires to communicate with parties willing to buy rights, or manufacture on royalty the above patent. Address Steam, AM. MACHINIST.

Inventer and owner of new valve and valve-gear for high-grade automatic engine; also governor for single-valve automatic engine, and other valuable specialties; one having had a large experience in steam engineering, wishes to connect his interests with party who would manufacture, or might sell. Address E. V. C., No. 12 Lakeside Building, Chicago, Ill.

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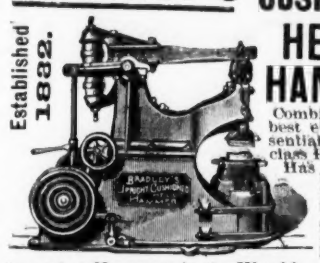

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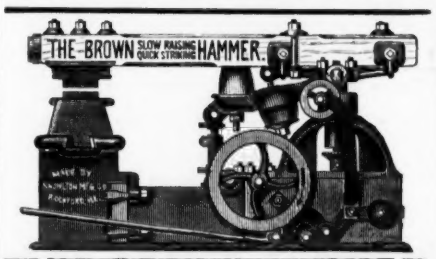
BRADLEY & CO. Syracuse, N.Y.



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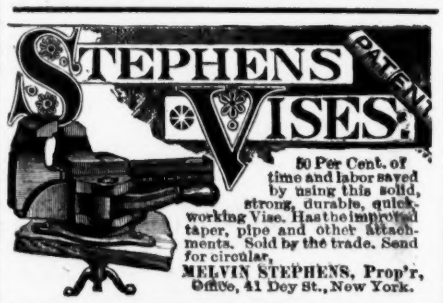
DOUBLE THE VELOCITY That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill



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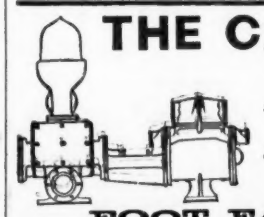

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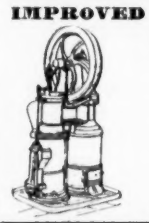

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Said iron foundry and shops are in good running condition. The plant is well established. Circular and band saw mills, and all other articles usually made in a first-class foundry are successfully manufactured here.

Sealed bids upon all or any part of the property, in cash or upon such terms as may be offered, will be received by me at any time before 1 o'clock December 1, 1885 and will be opened at that time. A complete inventory and appraisement will be mailed on application.

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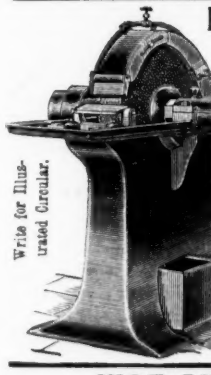

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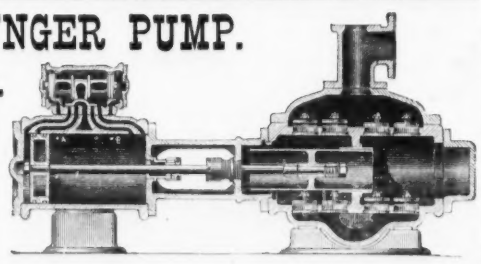

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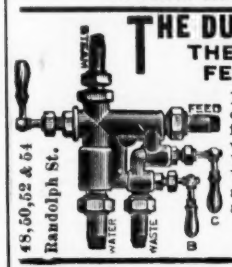

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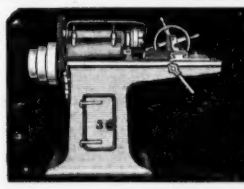

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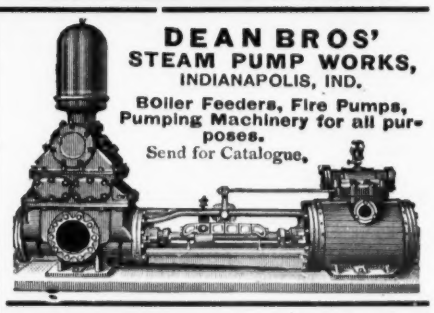

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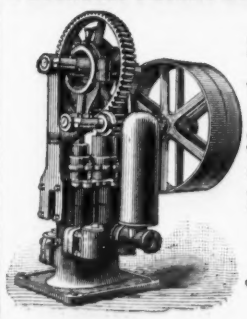

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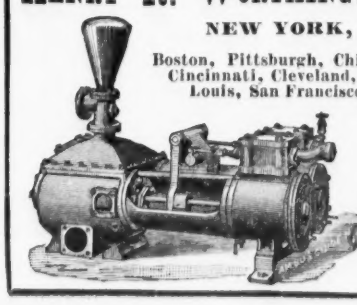

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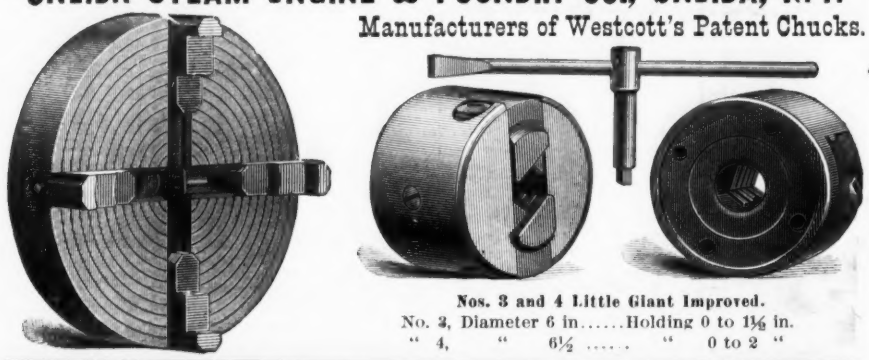

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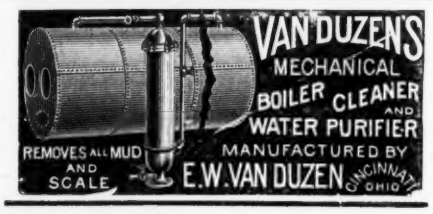

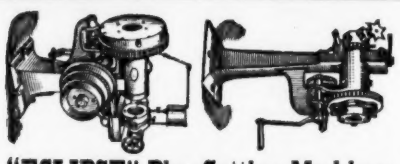

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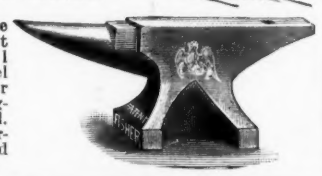

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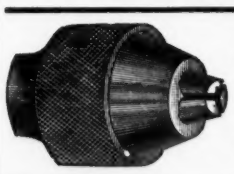

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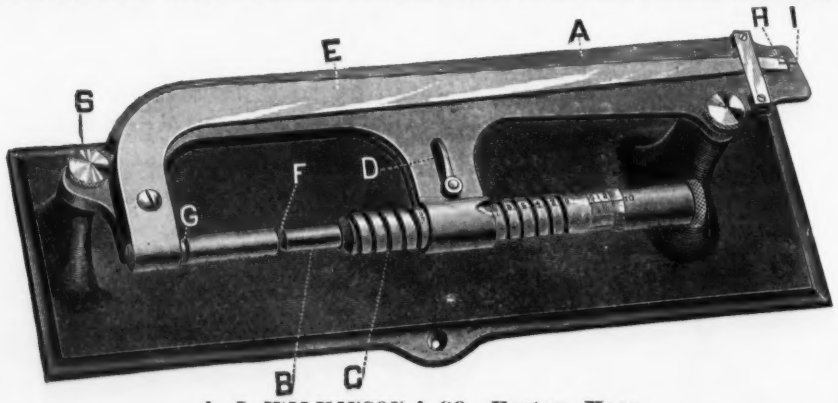

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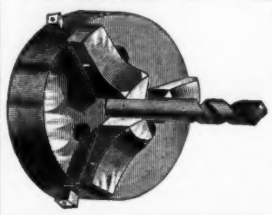

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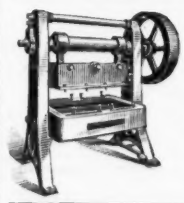

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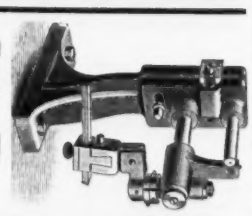

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NOTICE.

Week before last we published, under this heading, references to a small portion of the practical articles that have been specially prepared for the AMERICAN MACHINIST, and have appeared in our columns during the last few months. Last week we published an additional list. We append another list below. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

F. G. Woodward.
A Primitive Electro-Magnet Engine. Aug. 22, 188 ;
Car Transit by Endless Cable. Feb. 28, 1885.
How to Clean Foul Pipes. Dec. 6, 1884.
How to Originate a Scale of Equal Parts. Sept. 6, 1884.

Wm. H. Harrison.
The Development of the Connecting Rod. Sept. 5, 1885.
Balancing Revolving Bodies. March 21, 1885.

John A. Caldwell.
Blue Lines on White Ground. May 2, 1885.

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Pitch of Worm Gears. May 23, 1885.

J. A. Hill.
Oiling Locomotive Valve Motion. May 23, June 27, 1885.

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Casting Rolls on a Shaft May 23, 1885.
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Boiler Makers and Boiler Buyers' Methods. April 25, 1885.

Wm. Hultgran.
Foundry Foremen's Blunders. Jan. 24, 1885.
Shrinkage of Castings. May 23, 1885.

W. W. Hanscom.
Cable Railway Transit. July 26, 1884; March 28, 1885

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Reducing the Face of Spur Gears in the Mould. Feb. 28, 1885.

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Moulding Potash Kettles in Green Sand. Feb. 14 1885.
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Piston-Rod and Valve-Stem Packing. April 25, 1885

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Cylinder Oils — Economical Size for Engines. April 25, 1885.
Another Way to Pack a Piston-Rod. April 11, 1885
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M. W. Sewall.
Machine-Shop Floors. Dec. 6, 1884.

James W. See.
The Safety Element. Nov. 1, 1884.

C. E. Lipe.
Milling Machine Cutters for Double Duty. June 28, 1884.

David Spence.
Charging Cupolas. April 5, 1884
Tinning Wrought Iron. June 20, 1885

A. H. Mathesius.
Power Needed in Operating the Cable Road on Brooklyn Bridge. January 3, 1885

Jno. C. Trautwine, Jr.
What Is Centrifugal Force? April 5, 1884
Centrifugal Force, a Component of Tangential Tendency. April 26, 1884
Nature of Centrifugal Force. May 17, 1884

A. B. Landis.
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Tinning and Babbitting on Cast Iron. August 1, 1885.

T. H. Radcliff.
On the Warping and Cracking of Castings. July 18, 1885.

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Richmond & Danville R. R. Co.'s Cast Iron Smoke Stack. August 1, 1885.

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Inertia Diagram. October 18, November 1 and 22, 1884; January 3, 1885

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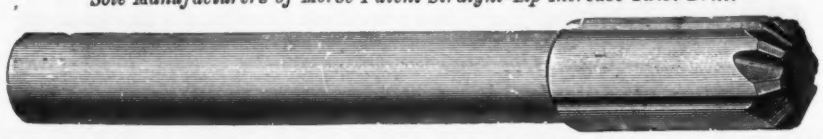

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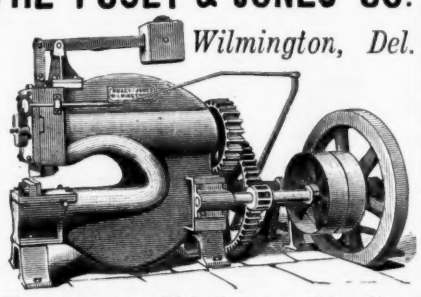

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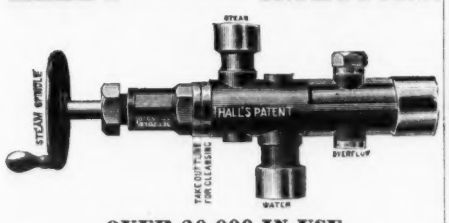

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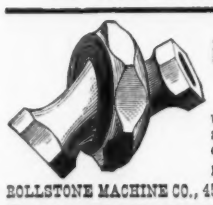

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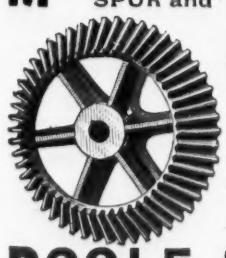

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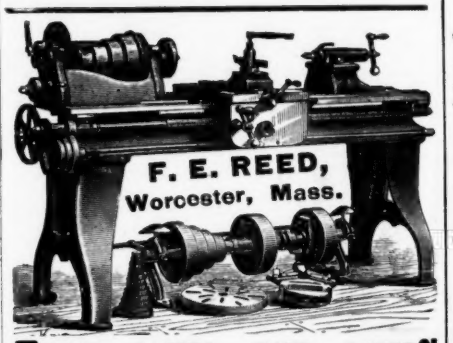

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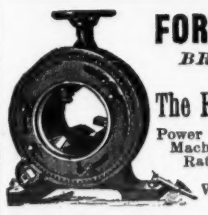

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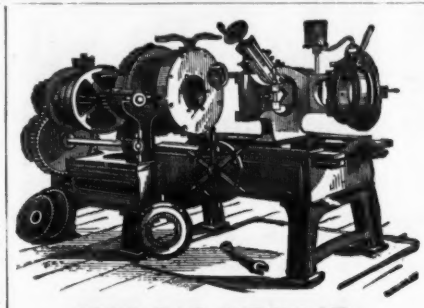

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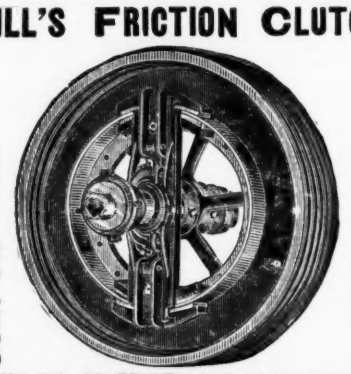

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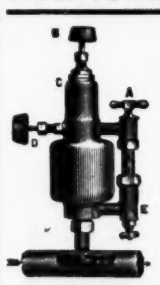

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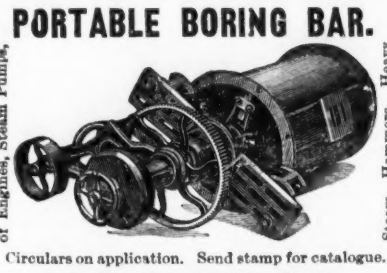

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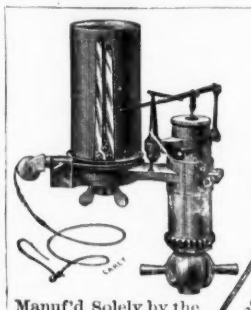

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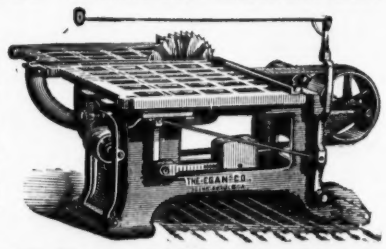

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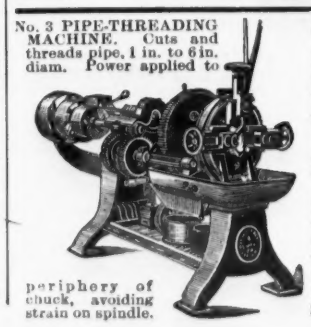

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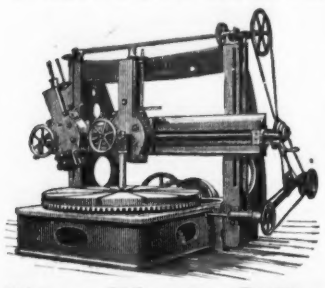

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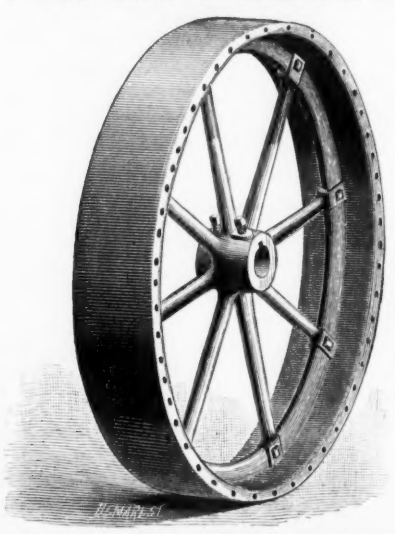

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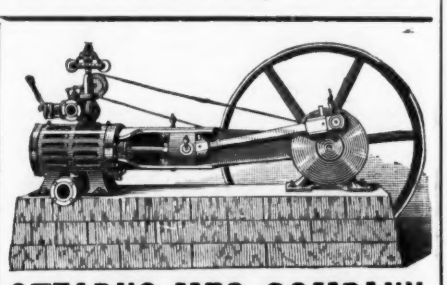

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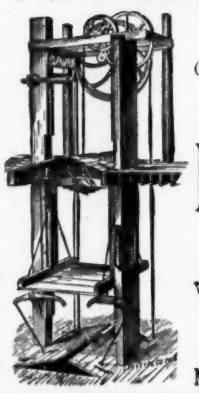

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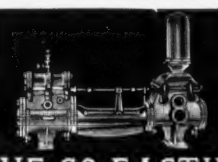

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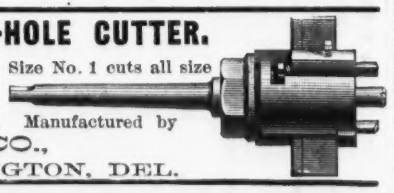

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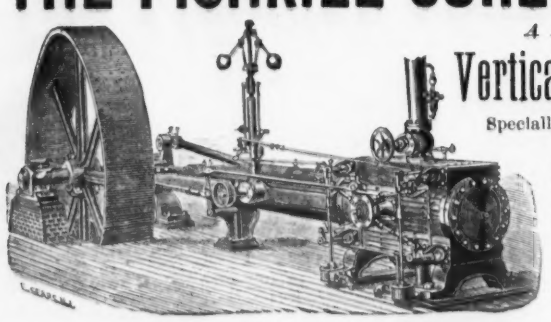

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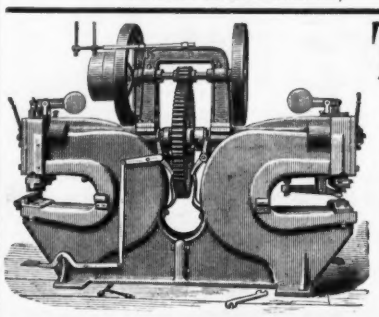

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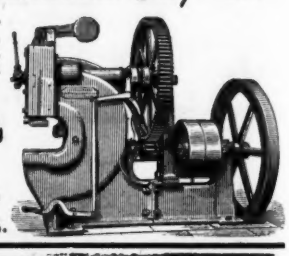

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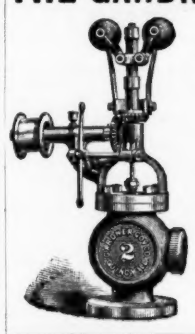

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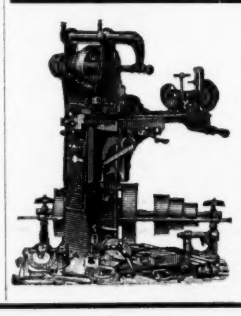

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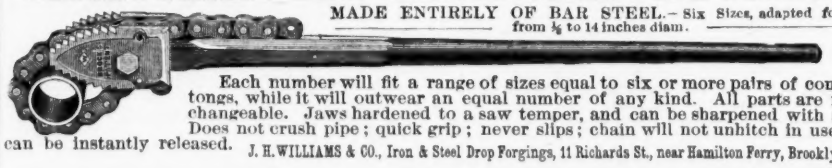

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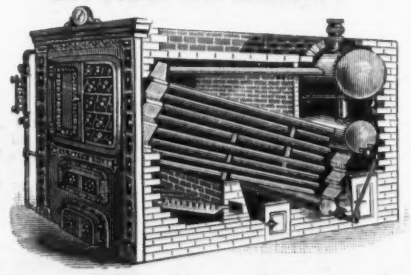

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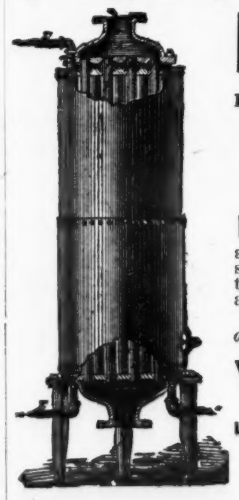

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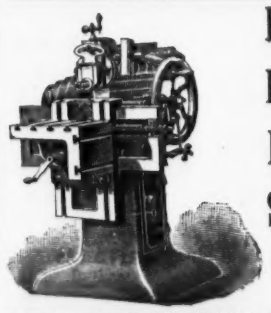

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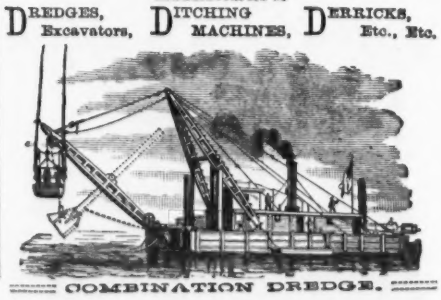

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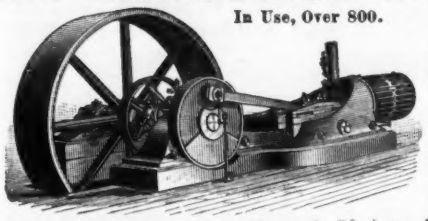

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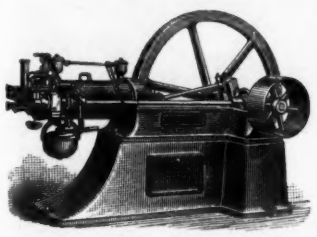

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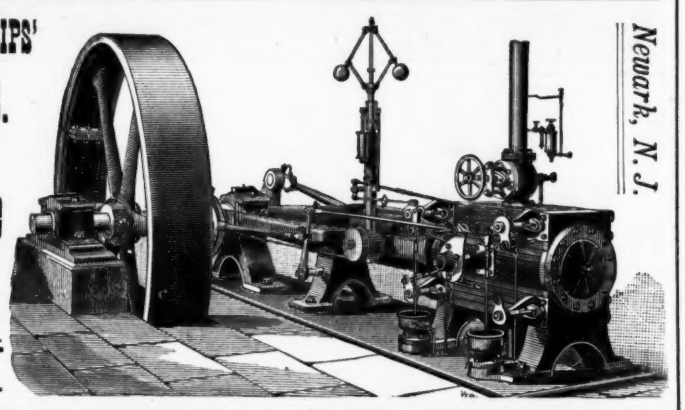

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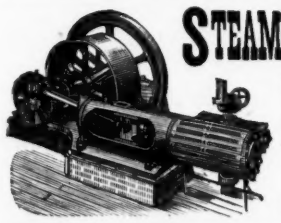

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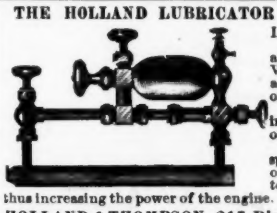

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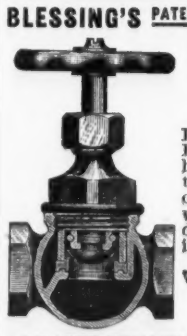

The Renewable Seats and Discs are cast from the best Phosphor Bronze Metal, which has lasting qualities, double that of the best Steam Metal commonly used in first-class valves. The Seats are simply dropped into place and held in position by bottom of cage.

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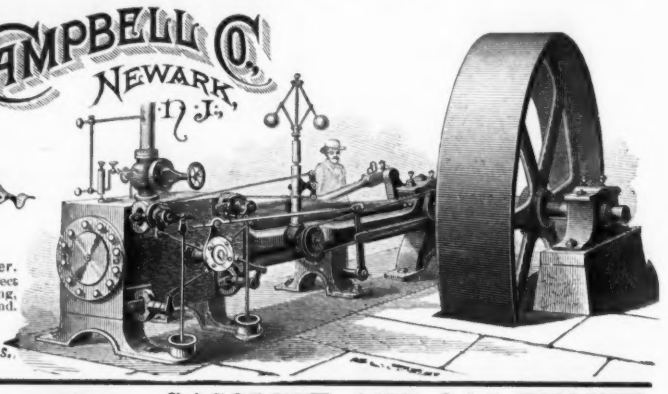
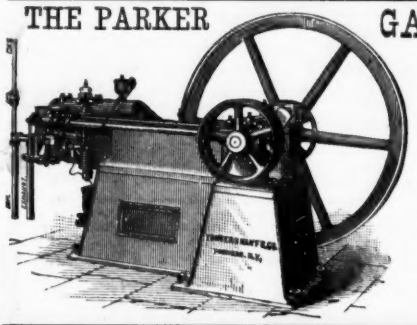


THE PARKER GASOLINE AND GAS ENGINE.



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Unsurpassed economy in use of Gas. One turn of the fly-wheel, acting upon the small dynamo, creates an electric spark sufficient to start the engine running.

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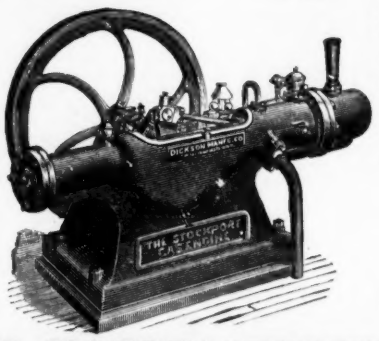
FOR Simplicity, Durability, Reliability, Economy, Lightness AND General Design.



Starts with ease.

Receives an impulse at every revolution.

Runs silently.

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MADE BY
Brown & Sharpe Mfg. Co.,
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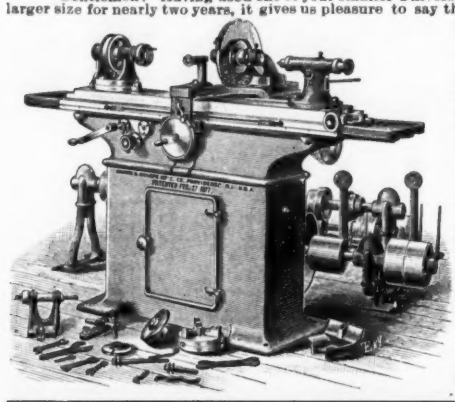
Gentlemen:—Having used one of your smaller Universal Grinding Machines for four years and another of the larger size for nearly two years, it gives us pleasure to say that they produce economically and well all the kinds of work for which they are intended and we could not dispense with them. Yours truly, Wm. B. Bement & Son.



Wm. Sellers & Co., Philadelphia, Feby. 7, 1885.

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Gentlemen:—In reply to your inquiry of the 6th inst., we have to say that we have been using your "Universal Grinding Machine" almost constantly since June, 1880, with very satisfactory results. We hope to add more to our plant as business increases. Yours truly, Wm. Sellers & Co.

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Gentlemen:—We have had in use since Aug., 1882, one of your Universal Grinding Machines, and since then have bought two more. We find them indispensable in our shop. It has become with us pretty well understood, that there is no way to make a good journal bearing and other cylindrical surfaces, except by grinding. Such a machine must be perfect in its construction to answer the purpose. We find that these machines respond to all the requirements. Very truly yours, The Pratt & Whitney Co. F. A. Pratt, Pres't.

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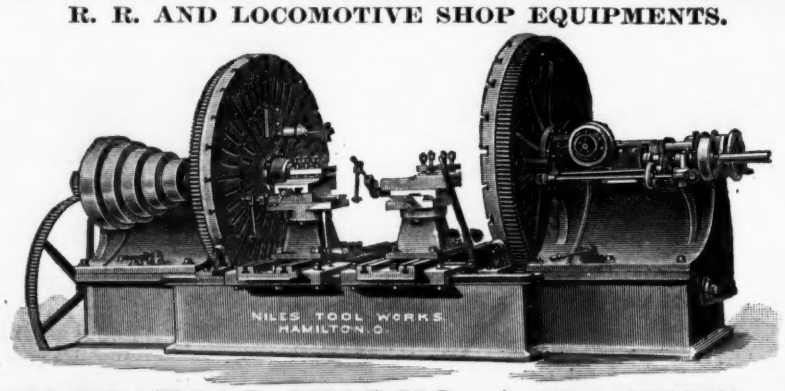

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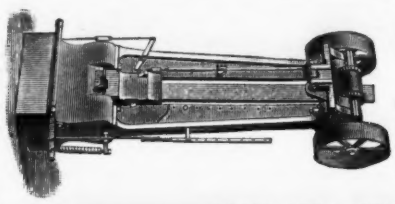

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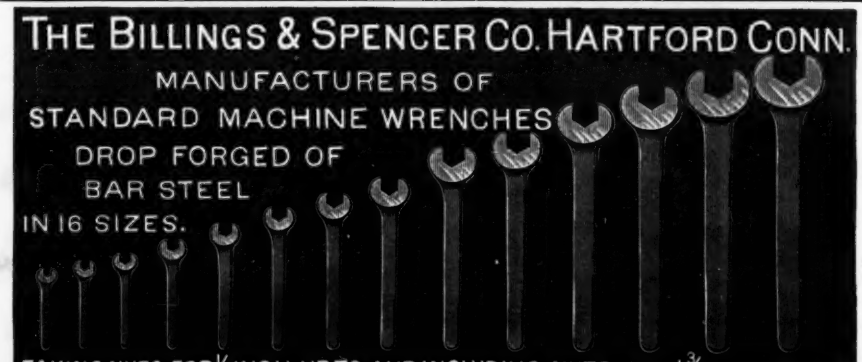

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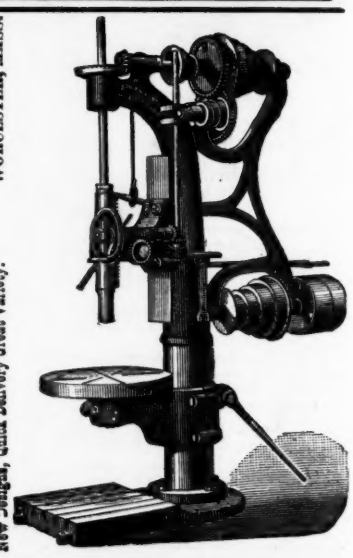

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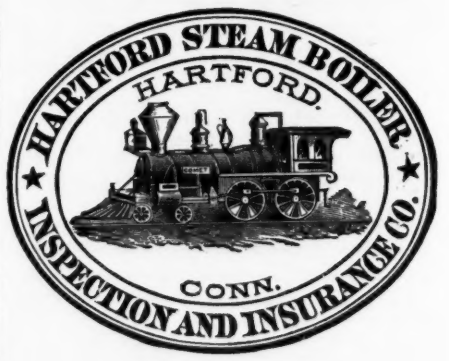

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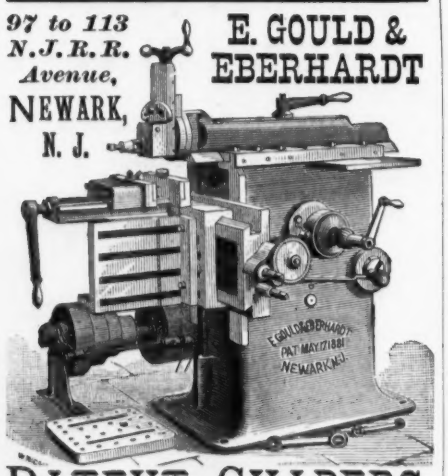

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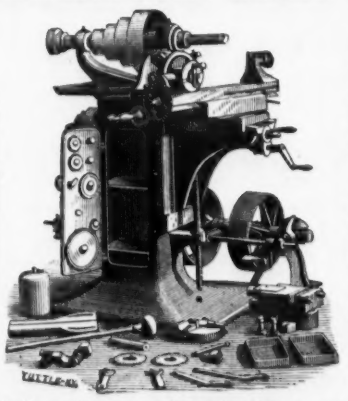

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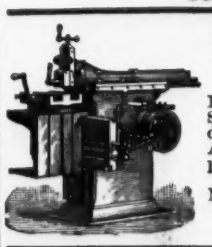

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